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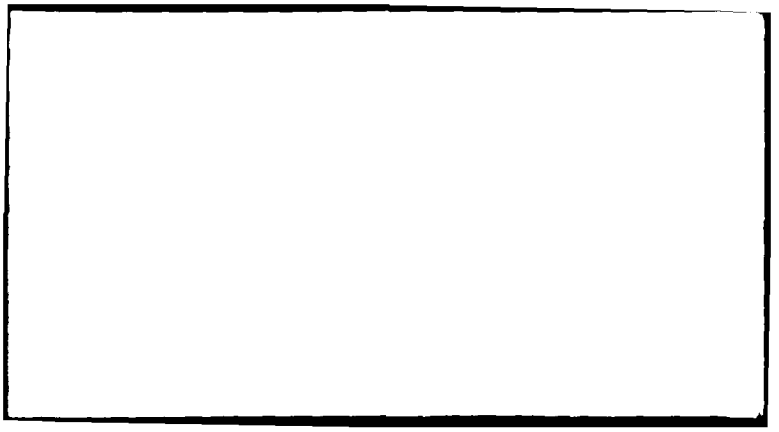

(6) A System Approach to Navy Medical Education and Training.

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APPENDIX 25.

COMPETENCY CURRICULA FOR
CLINICAL LABORATORY ASSISTANT
AND
MEDICAL LABORATORY TECHNICIAN

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APPLICATION OF A SYSTEM APPROACH
U.S. NAVY MEDICAL DEPARTMENT
EDUCATION AND TRAINING PROGRAMS
FINAL REPORT

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Bureau of Medicine and Surgery (Code 71G)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The study objective consisted of a determination of what the health care personnel in the Navy's Medical Department, Bureau of Medicine and Surgery actually do in their occupations; improving the personnel process (education and training); and building a viable career pathway for all health care personnel. Clearly the first task was to develop a system of job analyses applicable to all system wide health care manpower tasks. A means of postulating simplified occupational clusters covering some 50

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currently designated Navy enlisted occupations, 20 Naval Enlisted Classification Codes (NEC's) were computerized. A set of 16 groupings that cover all designated occupations was developed so as to enhance the effectiveness of professionals and sub-professionals alike.

FOREWORD

The project, "Application of a System Approach to the Navy Medical Department Education and Training Programs," was initiated in May of 1969 as a realistic, comprehensive response to certain objectives set forth in ADO 43-03X, and to memoranda from both the Secretary of Defense and the Assistant Secretary of Defense, Manpower and Reserve Affairs. The Secretary's concern was stated in his memorandum of 29 June 1965, "Innovation in Defense Training and Education." More specific concerns were stated in the Assistant Secretary's memorandum of 14 June 1968, "Application of a System Approach in the Development and Management of Training Courses." In this he called for "vigorous and imaginative effort," and an approach "characterized by an organized training program with precise goals and defined operational interrelation among instructional system components." He also noted, "Job analyses with task descriptions expressed in behavioristic terms are basic and essential to the development of precise training goals and learning objectives."

The Project

System survey and analysis was conducted relative to all factors affecting education and training programs. Subsequently, a job-analysis sub-system was defined and developed incorporating a series of task inventories "...expressed in behavioristic terms..." These inventories enabled the gathering of job activity data from enlisted job incumbents, and data relating to task sharing and delegation from officers of the Medical, Nurse and Dental Corps. A data management sub-system was devised to process incumbent data, then carry out needed analyses. The development of initial competency curricula based upon job analysis was implemented to a level of methodology determination. These methods and curriculum materials constituted a third (instructional) sub-system.

Thus, as originally proposed, a system capability has been developed in fulfillment of expressed need. The system, however, remains untested and unevaluated. ADO 43-03X called for feasibility tests and cost-effectiveness determination. The project was designed to so comply. Test and evaluation through the process of implementation has not proved feasible in the Navy Medical Department within the duration of the project. As designed and developed the system does have "...precise goals and defined operational interrelation among instructional system components." The latter has been achieved in terms of a recommended career structure affording productive, rewarding manpower utilization which bridges manpower training and health care delivery functions.

Data Management Sub-System

Job analysis, involving the application of comprehensive task inventories to thousands of job incumbents, generates many millions of discrete bits of response data. They can be processed and manipulated only by high speed computer capability using rigorously designed specialty programs. In addition to numerical data base handling, there is the problem of rapidly and accurately manipulating a task statement data base exceeding ten thousand carefully phrased behavioral statements. Through the use of special programs, task inventories are prepared, printouts for special purposes are created following a job analysis application, access and retrieval of both data and tasks are efficiently and accurately carried out, and special data analyses conducted. The collective programs, techniques and procedures comprising this sub-system are referred to as the Navy Occupational Data Analysis Language (NODAL).

Job Analysis Sub-System

Some twenty task inventory booklets (and associated response booklets) were the instruments used to obtain job incumbent response data for more than fifty occupations. An inventory booklet contains instructions, formatted questions concerning respondent information ("bio-data"), response dimension definitions, and a list of tasks which may vary in number from a few hundred to more than a thousand per occupational field.

By applying NODAL and its associated indexing techniques, it is possible to assemble modified or completely different inventories than those used in this research. Present inventories were applied about three years ago. While they have been rendered in operational format, they should not be re-applied until their task content is updated.

Response booklets were designed in OPSCAN mode for ease of recording and processing responses.

Overall job analysis objectives and a plan of administration were established prior to inventory preparation, including the setting of provisional sample target sizes. Since overall data attrition was forecast to approximate twenty percent, final sample and sub-sample sizes were adjusted accordingly. Stratified random sampling techniques were used. Variables selected (such as rating, NEC, environment) determined stratifications, together with sub-population sizes. About fifteen percent of large sub-populations were sought while a majority or all members of small sub-populations were sought.

Administration procedures were established with great care for every step of the data collecting process, and were coordinated with sampling and data analysis plans. Once set, the procedures were formalized as a protocol and followed rigorously.

Instructional Sub-System

Partial "competency curricula" have been composed as an integral sub-system bridging what is required as performance on the job with what is, accordingly, necessary instruction in the training process. Further, curriculum materials were developed to meet essential requirements for implementing the system so that the system could be tested and evaluated for cost effectiveness. However, due to the fact that test and evaluation was not feasible in the Navy Medical Department within the duration of the project, it was not possible to complete the development of the system through the test and evaluation phase. The inability to complete this phase also interrupted the planned process for fully developing the curricula; therefore, instead of completed curricula ready for use in the system, the curricula were partially developed to establish the necessary sub-system methodology. The competency curricula are based on tasks currently performed by job incumbents in 1971. (The currency of a given curriculum depends upon periodic analysis of incumbents' jobs, and its quality control resides in the evaluation of the performance competency of the program's graduates.)

A competency curriculum provides a planned course of instruction or training program made up of sequenced competency units which are, in turn, comprised of sequenced modules. These modules, emphasizing performance objectives, are the foundation of the curriculum.

A complete module would be comprised of seven parts: a cluster of related tasks; a performance objective; a list of knowledges and skills implied by the objective; a list of instructional strategies for presenting the knowledges and skills to the learner; an inventory of training aids for supporting the instructional strategies; a list of examination modes; and a statement of the required training time. In this project, curriculum materials have been developed to various levels of adequacy, and usually comprise only the first three parts; the latter four need to be prepared by the user.

The performance objective, which is the most crucial part of the module, is the basis for determining curriculum content. It is composed of five essential elements: the stimulus which initiates the behavior; the behavior; the conditions under which the behavior takes place; the criteria for evaluating the behavior; and the consequence or results of the behavior. A sixth element, namely next action, is not essential; however, it is intended to provide linkage for the next behavior.

Knowledges and skills listed in the module are those needed by the learner for meeting the requirements of the performance objective.

Instructional strategies, training aids, examination modes and training time have been specified only for the Basic Hospital Corps Curriculum. The strategies, aids and modes were selected on the basis of those considered to be most supportive in presenting the knowledges and skills so as to provide optimum learning effectiveness and training efficiency. The strategies extend from the classroom lecture as traditionally presented by a teacher to the more sophisticated mediated program for self-instruction. The training aids, like strategies, extend from the traditional references and handout material in the form of a student syllabus to mediated programs for self-instruction supported by anatomical models. Examination modes extend from the traditional paper and pencil tests to proficiency evaluation of program graduates on the job, commonly known as feedback. Feedback is essential for determining learning effectiveness and for quality control of a training program. The kind of instructional strategies, training aids and examination modes utilized for training are limited only by such factors as staff capability and training budget.

The training time specified in the Basic Hospital Corps Curriculum is estimated, based upon essential knowledge and skills and program sequence.

The competency curriculum module, when complete, provides all of the requirements for training a learner to perform the tasks set forth in the module. A module may be used independently or related modules may be re-sequenced into modified competency units to provide training for a specific job segment.

Since the curricula are based upon tasks performed by job incumbents in 1971, current analysis of jobs needs to be accomplished using task inventories that have been updated to reflect changes in performed tasks. Subsequent to job analysis, a revision of the curricula should be accomplished to reflect task changes. When the foregoing are accomplished, then faculty and other staff members may be indoctrinated to the competency curricula and to their relationship to the education and training system.

In addition to the primary use for the systematic training of job incumbents, these curricula may be used to plan for new training programs, develop new curricula, and revise existing curricula; develop or modify performance standards; develop or modify proficiency examinations; define billets; credentialize training programs; counsel on careers; select students; and identify and select faculty.

The System

Three sub-systems, as described, comprise the proposed system for Education and Training Programs in The Navy Medical Department. This exploratory and advanced developmental research has established an overall methodology for improved education and training incorporating every possible means of providing bases for demonstrating feasibility and cost effectiveness. There remains only job analysis sub-system updating, instructional sub-system completion, and full system test and evaluation.

Acknowledgements

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Identity and acknowledgement of the project Advisory Group during the project's final year is recorded in the Final Report.

Lastly, the project could not have been commenced nor carried out without the vision, guidance and outstanding direction of Ouida C. Upchurch, Capt., NC, USN, Project Manager.

CLINICAL LABORATORY

ASSISTANT

TABLE OF CONTENTS

COMPETENCY CURRICULUM FOR

CLINICAL LABORATORY ASSISTANT

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

COMPLTENCY UNIT I: HEMATOLOGY

This unit includes the following Modules:

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 1: CAPILLARY BLOOD SPECIMEN COLLECTION

TASKS

a. Prepare site for capillary puncture, i.e., finger tip, toe, ear lobe or heel
b. Collect blood in proper receptacles for tests requested
c. Prepare blood film on slide
d. Make appropriate dilutions when necessary

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request to collect capillary blood specimen

(Behavior) The CLA will prepare site, collect capillary blood in proper receptacles and, when necessary, make blood films on slides and dilute specimens

(Conditions) **With limited technical supervision; using alcohol sponges, hemolets, capillary tubes (with and without anticoagulants), glass slides, calibrated pipettes, diluting fluids**

(Criteria) Blood must be obtained from site at which the circulation is adequate. The blood should be free flowing and not diluted with tissue juices or alcohol. The blood film must be adequate and the dilutions should be accurately made

(Consequence) Adequate capillary blood specimen for the tests requested is collected and prepared for analysis

KNOWLEDGES AND SKILLS

Appropriate body sites from which to obtain capillary blood
Appropriate methods for stimulating circulation at puncture site
Criteria for making adequate blood smear
Appropriate diluting fluids
Proper receptacle for specific test
Proper capillary puncture techniques
Procedures for filling capillary tubes from a puncture wound
Techniques and procedures for diluting with micropipettes
Principles and procedures for making adequate peripheral blood films

Competency: **CLINICAL LABORATORY ASSISTANT (CLA)**

Unit: Hematology

MODULE 2: VENOUS BLOOD SPECIMEN COLLECTION

TASKS

a. Postion patient
b. Select venipuncture site
c. Prepare venipuncture site
d. Perform venipuncture with vacutainer or with needle and syringe
e. Collect adequate specimen
f. Change vacutainer tube or syringe
g. Label tubes

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request for collection of venous blood specimen

(Behavior) The CLA will position patient, select and prepare venipuncture site, perform venipuncture, collect adequate and appropriately preserved or anticoagulated specimen and label tubes

(Conditions) **With limited technical supervision; using alcohol sponge, tourniquet, vacutainer, needle adaptor or needle and syringe, tubes with and without anticoagulants**

(Criteria) Clean, swift venipuncture with minimal patient trauma; the specimen collected must be in the appropriate amount and proper container for laboratory analysis

(Consequence) Adequate venous blood specimen collected for tests requested

(Next Action) Check venipuncture site for bleeding and apply adhesive strip if necessary; send specimen to appropriate area for testing

KNOWLEDGES AND SKILLS

Patient positioning for venipuncture
Proper venipuncture sites
Proper preservation **procedures (e.g., immediate cooling for ammonia or acid phosphatase)**
Principles and use of anticoagulants
Use of **vacutainer**
Use of needle and syringe
Proper tubes and anticoagulants to use for **specific tests**
Care of patient following venipuncture
Technique for venipuncture with minimum patient trauma

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 3: HEMATOCRIT DETERMINATION, MANUAL

TASKS a. Perform microhematocrit by centrifugation

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for microhematocrit on blood sample
(Behavior)	The CLA will fill two capillary tubes to approximately 75 percent of capacity with well-mixed blood, seal one end, centrifuge at 16,000 rpm for 3 minutes, read result and note any icteric plasma and/or hemolysis
(Conditions)	With limited technical supervision; using capillary tubes, plasticine seal or flame, hematocrit reader, hematocrit centrifuge
(Criteria)	Quality control specimens to check technique and centrifuge; specimen must be done in duplicate and agree ± 1 percent; results should be three times greater than the hemoglobin value ± 2 percent; specimen must not be hemolyzed
(Consequence)	Plasma/packed cell ratio reported as volume/ packed red cells in percent; comment on icteric plasma if present
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Principles and use of microhematocrit centrifuge, relate rpm to relative centrifugal force and to time required for complete packing
Proper use of and techniques for obtaining plasma/packed cell ratio from hematocrit reader
Normal values
Precautions to avoid error, i.e., avoid hemolysis, do not include buffy coat in reading cell level and be sure maximum packing has occurred
Filling and sealing capillary tubes
Operation of microhematocrit centrifuge

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 4: ERYTHROCYTE SEDIMENTATION RATE

TASKS
a. Fill sedimentation rate tube
b. Place in vertical rack
c. Determine erythrocyte sedimentation rate

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of blood sample and request for erythrocyte sedimentation rate

(Behavior) The CLA will observe and determine erythrocyte sedimentation rate one hour after filling appropriate sedimentation rate tube to the proper level with appropriately anticoagulated blood and placing the tube in a vertical rack

(Conditions) **With limited supervision; using Wintrobe or Westegren sedimentation rate tubes, long-tipped pipettes, vertical positioning racks, timer**

(Criteria) Appropriate tube must be filled to the proper mark with well-mixed anticoagulated blood. Avoid bubbles. The tube must be placed in a vertical position and left standing **undisturbed at room** temperature for exactly one hour. Test should be initiated within three hours of blood collection and results read at the appropriate time

(Consequence) **Erythrocyte sedimentation rate expressed in mm/** hour

(Next Action) Record result

KNOWLEDGES AND SKILLS

Possible technical conditions causing false, abnormal results
Wintrobe method
Westegren method
Normal values
Pipetting, Westegren
Accurate filling of Wintrobe tube with disposable pipette
Techniques for proper positioning of tube and reading of scale on tube

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 5: PREPARATION OF STANDARD CURVE FOR DETERMINING HEMOGLOBIN CONCENTRATION

TASKS

a. Prepare four hemoglobin standards which are each a different concentration of hemoglobin
b. Read the absorbance of each standard on an appropriate colorimeter or spectrophotometer
c. Plot the concentration vs. absorbance on graph paper and draw a straight line through the points intercepting zero

PERFORMANCE OBJECTIVE

(Stimulus)	Upon direction by senior technologist
(Behavior)	The CLA will prepare a standard curve for determining hemoglobin concentration
(Conditions)	With limited supervision; using cuvettes, spectrophotometer, pipettes, stock standard, cyanmethemoglobin diluent, preparation of dilutions according to directions of manufacturer
(Criteria)	Accurate dilutions, proper wavelength, accurate reading of spectrophotometer
(Consequence)	A standard calibration curve against which to measure hemoglobin concentration
(Next Action)	Determine hemoglobin concentration

KNOWLEDGES AND SKILLS

Pipetting
Diluting
Use and maintenance of cuvettes
Use and maintenance of spectrophotometer
Wavelength for reading hemoglobin concentration
Plotting a concentration curve on graph paper

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 6: DETERMINING HEMOGLOBIN CONCENTRATION

TASKS a. Determine hemoglobin concentration using cyanmethemoglobin method

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for hemoglobin determination on blood sample
(Behavior)	The CLA will obtain absorbance reading after diluting .02 ml blood in cyanmethemoglobin; and determine hemoglobin concentration in grams/100 ml
(Conditions)	**With limited supervision; using hemoglobin pipette (.02 ml), autodiluter to dispense 5 ml cyanmethemoglobin reagent, graph prepared from known hemoglobin standard (4 concentrations), cuvettes, spectrophotometer, reagent blank**
(Criteria)	Duplicate measurements must agree within $\pm$ 0.5 grams/100 ml; standard must read within $\pm$ 3 absorbance units of its original reading on calibration curve; quality control specimen must read within acceptable range; hemoglobin must be 1/3 the value of the hematocrit
(Consequence)	Hemoglobin concentration derived in **grams/100 ml blood**
(Next Action)	Record result

KNOWLEDGES AND SKILLS

Pipetting
Proper care and use of cuvettes, spectrophotometers and autodiluters
Conversion of absorbance reading to hemoglobin concentration from a standard calibration curve

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 7: BLOOD LEUKOCYTE, ERYTHROCYTE AND PLATELET COUNTS, MANUAL

TASKS

a. Prepare blood sample for counting leukocytes on a hemacytometer
b. Determine leukocyte counts using a hemacytometer
c. Prepare blood samples for counting erythrocytes on a hemacytometer
d. Determine erythrocyte counts on a hemacytometer
e. Prepare blood samples for counting platelets on a hemacytometer
f. Determine platelet counts on a hemacytometer

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of blood specimen requiring leukocyte, erythrocyte or platelet count

(Behavior) The CLA will perform requested count after using appropriate diluent and dilution and charging hemocytometer

(Conditions) With supervision; using Neubauer hemacytometer, coverslip, red and white cell pipettes or unopettes, red and white cell diluents, platelet diluent, moist petri dishes, aspirator, phase microscope, microscope with oil immersion lens, hand tally

(Criteria) Cell counts must be within $\pm$ 10 of serial counts on same specimen

(Consequence) A count is obtained in cells/mm^3

(Next Action) Record results

KNOWLEDGES AND SKILLS

Dimensions of hemacytometer
Pipette dilutions and size
Appropriate diluent for type of cell count performed
Derivation of number of cells/mm3 from dimensions of hemacytometer, dilution used, surface area and number of cells counted
Normal values
Care and maintenance of hemacytometer and coverslips
Proper charging of hemacytometer
Pipetting
Proper use of microscope

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 8: ERYTHROCYTE INDICES, MANUAL

TASKS a. Calculate erythrocyte indices manually

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request to calculate red cell indices on blood sample

(Behavior) The CLA will calculate mean corpuscular volume mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration from red cell count in cells/mm^3, hemoglobin concentration in grams/100ml, and hematocrit in percent

(Conditions) With limited supervision; using previously determined erythrocyte count, microhematocrit and hemoglobin concentration, calculator or paper and pencil

(Criteria) Calculations will be crosschecked by viewing slide for red blood cell morphology; all parameters must be repeated if the two do not correlate

(Consequence) Values are obtained for mean corpuscular volume in cubi microns, mean corpuscular hemoglobin in picograms and mean corpuscular hemoglobin concentration in percent

(Next Action) Submit all data to supervising technologist for evaluation

KNOWLEDGES AND SKILLS

Normal values
Formulas for calculating erythrocyte indices
Mathematical calculations--manual or calculator

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 9: PERIPHERAL MORPHOLOGY TECHNIQUE

TASKS

a. Fix and stain smears to demonstrate cell morphology
b. Determine morphological variations of erythrocytes and leukocytes
c. Determine leukocyte differential
d. Check smear for adequate morphology and number of platelets

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of peripheral blood film for staining and examination

(Behavior) The CLA will prepare smears for microscopic examination by fixing blood film in methanol and staining with Wright's or Wright-Giemsa stain; examine stained slide noting morphology of erythrocytes and leukocytes, differential of leukocytes and number and morphology of platelets

(Conditions) With supervision; using Wright's or Wright-Giemsa stain and buffer solution, microscope with oil immersion lens, cell counting tabulator

(Criteria) Erythrocytes should be yellowish red and neutrophils should have dark purple chromatin pink cytoplasm and lilac granules; erythrocytes must be distributed so that appropriate morphology can be distinguished; differentiate 100 leukocytes; abnormal leukocytes should be checked by supervisor; platelets should not be agglutinated

(Consequence) A white cell differential count and a platelet estimate are obtained and any morphologic aberrations of erythrocytes, leukocytes and platelets are noted

(Next Action) Record results, send slide with abnormal cell forms to pathologist for review, file slide

KNOWLEDGES AND SKILLS

Dehydration and fixation of blood
Principles and use of Romanowsky stains, i.e., Wright's, Giemsa's, May-Grunwald, etc.
Causes and remedies of abnormal staining colors
Erythrocyte morphology, normal and abnormal
Cell maturation and morphologic characteristics
Leukocyte types: normal and abnormal; neutrophil, band, eosinophil, basophil, lymphocyte, monocyte
Recognition of young, immature leukocytes
Recognition of abnormal leukocyte morphology

Platelet morphology
Estimating platelet numbers
Normal values
Use of oil immersion microscope
Use of differential cell tabulator

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 10: RETICULOCYTE COUNTS

TASKS

a. Prepare blood specimen for reticulocyte count
b. Determine reticulocyte count

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of blood specimen requiring a reticulocyte count
(Behavior)	The CLA will obtain reticulocyte count in percentage after properly preparing specimen
(Conditions)	With limited supervision; using blood specimen, slides, stain, microscope, pipettes, timer clock, hand tally
(Criteria)	Results must agree within one percent when two CLAs perform a reticulocyte count, each using a different stained film
(Consequence)	Reticulocyte count is obtained and expressed in percent
(Next Action)	Record and report results in percent

KNOWLEDGES AND SKILLS

Principles of staining reticulocytes
Reticulocyte morphology
Normal values
Calculation of results in percent
Preparation and staining of smear
Technique of counting using a microscope with oil immersion lens

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 11: SICKLE CELL SCREENING

TASKS a. Perform sickle cell test (screening)

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of sample requiring sickle cell screening
(Behavior)	The CLA will perform sickle screening test by sodium metabisulfite, sickle-dex or other kit method
(Conditions)	With supervision; using blood specimen, glass slides, coverslips, microscope, reagents, timer clock, test tubes, pipettes, control specimens
(Criteria)	Proper results must be obtained with positive and negative controls
(Consequence)	Determination of positive/negative results for sickle cell screen
(Next Action)	Forward positive results to electrophoresis; report negative results

KNOWLEDGES AND SKILLS

Principles of the sickle cell test with sodium metabisulfite and kit methods
Technique of performing tests and reading end point turbidity
Sources of error
Normal values
Making sickle cell prep using sodium metabisulfite
Applying coverslips and sealing out oxygen

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 12: EOSINOPHIL COUNTS

TASKS

a. Prepare blood specimen for counting eosinophils on a Fuchs-Rosenthal hemacytometer
b. Determine total eosinophil count

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of blood specimen requiring an eosinophil count
(Behavior)	The CLA will prepare specimen and perform an eosinophil count
(Conditions)	With limited supervision; using leukocyte pipette, Pilot's solution, Fuchs-Rosenthal hemacytometer and cover glass, microscope and hand tally
(Criteria)	Duplicate counts must agree within 10 percent
(Consequence)	Total eosinophil count is obtained in cells/mm^3
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Proper diluting fluid and dilution
Dimensions of Fuchs-Rosenthal hemacytometer
Eosinophil morphology
Calculating total eosinophil count using the dilution dimensions of hemacytometer, area and number of eosinophils counted
Sources of error
Normal values

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 13: CELL COUNTS AND DIFFERENTIALS ON BODY FLUIDS OTHER THAN BLOOD

TASKS

a. Count leukocytes and erythrocytes
b. Determine percent crenation of erythrocytes
c. Do leukocyte differential

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of body fluid requiring cell count and differential

(Behavior) The CLA will count and differentiate cells

(Conditions) With supervision; using dropper or capillary tube, Neubauer hemacytometer and cover glass, microscope, hand tally, centrifuge, acetic or Wright's stain, glass slide and differential cell tabulator

(Criteria) Obtain duplicate cell counts within $\pm$ 10 percent of each other; perform leukocyte differential if total leukocyte count is greater than ten cells/mm^3; report abnormal cells to senior technologist

(Consequence) Total leukocyte and erythrocyte count in cells/mm^3 and leukocyte differential and percent of crenated erythrocytes obtained

(Next Action) Report abnormal morphology to supervising technologist; record results

KNOWLEDGES AND SKILLS

Appearance of cell morphology in body fluids
Appearance of crenated cells
Leukocyte differential using acetic acid
Leukocyte differential using Wright's stain
Normal values

Competency: CLINICAL LABORATORY ASSISTA (CLA)

Unit: Hematology

MODULE 14: LUPUS ERYTHEMATOSUS (L.E.) CELL PREPARATION

TASKS a. Prepare specimen for L.E. cell evaluation

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of blood sample requiring examination for L.E. cells
(Behavior)	The CLA will prepare blood specimen, i.e., make smear of buffy coat and stain for L.E. cell evaluation
(Conditions)	With supervision; using blood specimen, test tubes, centrifuge, slides, pipettes, stain, 37-degree-centrigrade heat bath (optional), wire screen, petri dish
(Criteria)	Many white cells should be found on smear; preparation should meet minimum acceptable standards when reviewed by senior technician
(Consequence)	A well prepared L.E. preparation
(Next Action)	Deliver L.E. preparation to supervising technologist for evaluation

KNOWLEDGES AND SKILLS

Proper incubation time, cell trauma
Smear Preparation and staining
Techniques of smear preparation and staining

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 15: COMPLETE BLOOD COUNT (CBC), AUTOMATED

TASKS

a. Determine erythrocyte and leukocyte counts
b. Measure hemoglobin and hematocrit
c. Calculate erythrocyte indices using automated analysis
d. Prepare appropriate sample dilutions (e.g., on Coulter FN and ZBI)
e. Perform minor troubleshooting procedures and make simple repairs

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a blood sample requiring a CBC
(Behavior)	The CLA will make appropriate sample dilutions when necessary, operate instrument according to manufacturer's instructions, take complete blood count and, when necessary, diagnose any problems with the instrument and make simple repairs
(Conditions)	With limited supervision; using instrument that has been properly primed and standardized
(Criteria)	Instrument must be operating properly and controls must be within acceptable range, duplicate results should be within $\pm$ 2 percent, extreme values (specified by manufacturer) must be repeated, i.e., high values must be diluted and low values submitted for manual analysis
(Consequence)	Values for erythrocyte and leukocyte counts, hemoglobin and hematocrit levels and erythrocyte indices obtained by automated analysis
(Next Action)	Record results or resubmit extreme values for further analysis

KNOWLEDGES AND SKILLS

Preparation of instrument for operation
Operation procedure of instrument
Troubleshooting procedures
Manipulations required in operating procedure
Making minor repairs

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Hematology

MODULE 16: BASIC COAGULATION SCREENING

TASKS

a. Perform tourniquet test
b. Determine bleeding time
c. Evaluate clot retraction and clot lysis
d. Perform prothrombin and partial thromboplastin times (manually or automated)
e. Perform test for fibrinogen level
f. Perform test for fibrin split products

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for basic coagulation screening on a patient
(Behavior)	The CLA will perform tourniquet test, bleeding time, clot retraction, clot lysis, prothrombin time, partial thromboplastin time, fibrinogen level, and fibrin split products test
(Conditions)	With limited supervision; using sphygmomanometer, stopwatch, hemolet, alcohol sponge, filter paper, clotted whole blood, citrated plasma, water bath at 37 degrees centigrade, pipettes, test tubes, reagents, spectrophotometer, fibrin split products kit, fibrometer or other automated coagulation analyzer
(Criteria)	Count petechia after five minutes with sphygmomanometer properly inflated, perform sharp puncture and regularly absorb blood on filter paper watching time closely, control within proper range on coagulation tests and obtain adequate duplications
(Consequence)	Results obtained for tourniquet test, bleeding time, clot retraction and clot lysis, prothrombin time, partial thromboplastin time, fibrinogen and fibrin split products
(Next Action)	Report normal results, present abnormal results to supervising technologist for evaluation

KNOWLEDGES AND SKILLS

Methodologies of all tests above
Sources of error in all test above
Normal values
Operational procedures of any automated coagulation analyzers used
Knowledge of troubleshooting and minor repairs for the automated coagulation analyzers used

How to use a sphygmomanometer
Making adequate puncture for bleeding time
Absorbing blood properly with filter paper
Tilting tubes for detecting fibrin clot formation
Operation of automated coagulation analyzers
Patient instruction

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

COMPETENCY UNIT II: MICROBIOLOGY

This unit includes the following Modules:

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 1: Media Preparation

TASKS
a. Prepare culture media from basic ingredients, e.g., beef extract
b. Prepare culture media using commercially dehydrated products

PERFORMANCE OBJECTIVE

(Stimulus) Upon receiving a request for microbiologic culture media

(Behavior) The CLA will interpret the request to determine what culture media must be procured; and will prepare and store appropriate media

(Conditions) **With limited technical supervision; using balances, refrigerator, autoclave, gas flame, sterile dispensers, petri dishes, dry and liquid reagents, filters and flasks; in media preparation room**

(Criteria) Upon technical review by bacteriologist, media is found correctly **prepared according to standard** procedures

(Consequence) Consistently sterile media able to support proper microorganism growth

(Next Action) Supply bacteriology lab with proper sterile and refrigerated media

KNOWLEDGES AND SKILLS

Principles and operation of media preparation equipment, e.g., balances, filters, flasks, shaker apparatus, autoclave
Media preparation formulae
Rehydration of commercially dehydrated products to preserve chemical properties
Standard media storage recommendations
Media preparation technique under sterile conditions
Outdating of commercial media

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 2: COLLECTION AND TRANSPORTATION OF CLINICAL SPECIMENS

TASKS
a. Collect clinical specimen by sterile swab
b. Transport specimen to laboratory

PERFORMANCE OBJECTIVE

(Stimulus) Upon request for collection of material **from** eye, ear, nose, throat, wound, rectum, urogenital orifices or other site from patient prior to antibiotic or antimicrobial treatment

(Behavior) The CLA will collect specimen with a sterile swab and place in a sterile container **or in a** tube of transport medium as per request, prevent external contamination of specimen and deliver promptly to the laboratory

(Conditions) **Without technical supervision; using swabs in accordance with correct collection and transportation technique**

(Criteria) Collected in accordance with physician's directions and standardized laboratory protocol

(Consequence) Proper swabbing of area with a sterile swab to collect an uncontaminated specimen for diagnostic testing

(Next Action) Determination of appropriate diagnostic media for inoculation

KNOWLEDGES AND SKILLS

Techniques to collect samples for culturing
Growth requirements for microorganisms
Use of transport media to prolong survival, e.g., Stuarts
Neutralization of bactericidal effect of some commercial swabs
Safety precautions to prevent accidental laboratory infection
Cooperation and coordination between physician and laboratory personnel

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 3: PROCESSING SPECIMENS FOR CULTURING AND STAINING

TASKS
a. Select appropriate culture media
b. Log direct smear, stained/unstained

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a microbiologic specimen in a sterile container, transport media, e.g., Stuarts, or on clean glass slides, for staining

(Behavior) The CLA will identify the specimen, log it in, and determine what diagnostic media (e.g., simple enriched, selective) or smear (stained or unstained) should be prepared. He will label the received slides adequately for identification and delineation of area in which the smear is to be placed

(Conditions) With limited supervision; using appropriate log and local laboratory list of primary media for identification of bacterial pathogens

(Criteria) Upon technical review is found correct, i.e., appropriate media and/or smear based on source of specimen

(Consequence) Determination of appropriate initial media for culture isolation and correctly labeled slide

(Next Action) Inoculation of diagnostic media and broth for growth and further identification of bacterial pathogens, and staining of needed smears

KNOWLEDGES AND SKILLS

Principles and procedures to ensure safety and sterility in handling specimens
Types of media most suitable for isolation and identification of pathogens from different sites
Proper slide identification and logging methods
Host-parasite relationship as it applies to bacteriologic disease
Clinical correlation
Epidemiology of microbial disease

Competency: CLINICAL ALBORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 4: PRIMARY CULTURING, SMEAR PREPARATION AND STAINING

TASKS

a. Prepare routine stains
b. Inoculate culture media
c. Prepare routine smears
d. Prepare for bacterial colony counts by calibrated loop
e. Prepare for bacterial counts by dilution
f. Inoculate bacterial broth prior to plating media
g. Stain smears to demonstrate possible presence of bacteria

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of microbiologic specimen for culturing to determine bacterial growth, or staining

(Behavior) The CLA will sterilize a platinum wire loop with proper flaming technique and inoculate onto media and/or broth using correct inoculation technique to achieve possible bacterial growth. He will prepare smear, label slides adequately for identification and delineation of area in which the smear is to be placed, and stain smear

(Conditions) With limited technical supervision; using appropriate wire loop, flame, solid and liquid media, glass slides, chemical and heat fixatives, Gram stains and standard operating procedures; in accordance with laboratory protocol

(Criteria) Upon technical review, growth and isolation of bacterial colonies, media inoculation, and correctly prepared and evenly stained smears are judged correctly performed according to set quality control and standard testing and staining techniques and modifications

(Consequence) Consistently valid testing for bacterial growth and isolation of bacterial colonies with their proper distribution on plates and accurately prepared and stained smears for microbiologic interpretation

(Next Action) Incubate inoculated media for growth and identification and examine smear microscopically for interpretation, the findings of which will be reviewed with supervisory personnel

KNOWLEDGES AND SKILLS

Streaking and isolation techniques
Dilution mathematics
Growth and nutritional characteristics
Survival rates of different genera and species
Quality control procedures
Use of wire loop and flame for inoculating media and making calibrated loop counts
Inoculation, dilution and stabbing techniques
Sterile and quality smear preparation principles
Theory of Gram stain reaction
Fixing techniques
Staining to determine purity and assist in identification
Preparation and staining techniques for microbiologic smears
Gram stain reagent preparation

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 5: INCUBATION

TASKS
a. Incubate culture in 37° C. aerobic incubator
b. Incubate culture in CO_2 incubator (37°)
c. Incubate culture under anaerobic conditions

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specimen inoculated on media and/or broth for growth under aerobic and/or anaerobic conditions
(Behavior)	The CLA will place media in proper incubator or under proper conditions for desired growth
(Conditions)	With minimal supervision; using basic instrumentation according to manufacturer's recommendations and modifications corresponding to growth requirements of organisms, and appropriate incubator
(Criteria)	Upon technical review, the proper maintenance of temperatures and atmosphere, quality control and standard testing procedures are judged correctly performed
(Consequence)	Growth or no growth of desired organisms
(Next Action)	Observe media for growth and identification

KNOWLEDGES AND SKILLS

Theory of bacterial growth conditions and applicability to incubator types
Methods of creating incubator atmospheres and proper temperature
Safe operation of laboratory incubators
Use of incubator control indicators

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 6: MICROSCOPIC INTERPRETATION OF BACTERIA

TASKS
a. Recognize bacteria by Gram stain
b. Recognize bacteria by special purpose stains
c. Identify bacteria by fluorescent staining

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of stained specimen for microscopic interpretation
(Behavior)	The CLA will interpret the stained smear of the microorganism by clinical microscopy
(Conditions)	With limited technical supervision; using the appropriate microscope with proper attachments, in accordance with laboratory examination technique
(Criteria)	Upon technical review is found correctly performed with regard to quality control and standardization
(Consequence)	Will demonstrate proper interpretation of stained bacterial smears with reliable and reproducible results
(Next Action)	Report organisms seen

KNOWLEDGES AND SKILLS

Theory of microscopic illumination
Bacterial morphology
Bacterial staining properties
Normal and abnormal flora
Use of light microscopic equipment and attachments; use of fluorescent microscope
Identification of microorganisms as to gram-positive and -negative cocci or bacillus
Correlation of results with type of specimen
Quality control procedures

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 7: BACTERIAL RECOGNITION BY CULTURE

TASKS
a. Recognize bacteria on basic culture media
b. Recognize bacteria on selective media
c. Recognize bacteria on enriched media
d. Recognize bacteria by colonial morphology
e. Recognize bacteria by odor characteristics

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of incubated culture media for preliminary identification of bacteria as to possible genera and species or group
(Behavior)	The CLA will perform basic pathogen preliminary identification by morphologic colonial characteristics and physicochemical reaction on selective or enriched media, and report on appropriate form
(Conditions)	With supervision; using appropriate media, inoculation, incubation temperature, wire loop and flame
(Criteria)	Is judged correctly performed in accordance with quality control and current standard testing procedures for recognition
(Consequence)	Possible pathogen recognition
(Next Action)	Determine if biochemical testing is needed and submit isolates for sensitivity studies, if relevant

KNOWLEDGES AND SKILLS

Basic colonial morphology
Growth requirements of microorganisms
Enriched and selective media
Selection of isolated colonies
Techniques of subculturing in media and broth
Recognition of common groups of pathogens and nonpathogens

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 8: BACTERIAL IDENTIFICATION USING DIFFERENTIAL MEDIA

TASKS

a. Perform tube carbohydrate and biochemical testing
b. Do motility testing
c. Identify enteric pathogens to group using antisera methodology
d. Identify Enterobacteriaceae with differential systems, e.g., API and Enterotube

PERFORMANCE OBJECTIVE

(Stimulus)	Need to identify bacterial microorganisms with biochemical testing as to specific genera and/or species
(Behavior)	The CLA will perform bacterial pathogen species identification by testing physicochemical reactions on selected media as outlined in lab protocol and report results on appropriate form
(Conditions)	With supervision; using appropriate differential media and biochemical reagents with proper inoculation and incubation protocol
(Criteria)	Upon technical review is judged correctly performed with regard to quality control and standardization of procedures for reproducible results
(Consequence)	Results will demonstrate properly identified pathogen
(Next Action)	Refer diagnostic problems or confirmatory testing to reference laboratory; submit for sensitivity studies if relevant

KNOWLEDGES AND SKILLS

Growth requirements of bacteria
Antigen-antibody agglutination reactions
Biochemical reactions of various organisms
Basic colonial bacterial morphology
Physicochemical reactions of bacterial species
Selection of isolated pure colonies for further identification
Media and broth inoculation and selection for differential testing
Identification of groups of bacterial pathogens
Use of antisera
Identification of bacteria by biochemical reactions
Use of quality control specimens

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 9: ANTIMICROBIAL SUSCEPTIBILITY

TASKS

a. Determine antimicrobial susceptibility of bacteria by Kirby Bauer method
b. Determine antibiotic sensitivity of bacteria by tube dilution method
c. Determine serum antibiotic level by tube dilution methods

PERFORMANCE OBJECTIVE

(Stimulus) Receipt of request for identified pathogen to be tested for relative susceptibility to specified antibiotics

(Behavior) The CLA will perform antibiotic activity testing as ordered either by use of impregnated discs on the surface of media (Mueller Hinton) seeded with test organism, or by bacteria or serum tube dilution methods according to standard laboratory protocol

(Conditions) With limited technical supervision; using appropriate broth and/or agar media, antibiotic discs, tubes, incubator and serum or test organisms

(Criteria) Is judged correctly performed with regard to technique, quality control and pure culture isolate for reliable and reproducible results

(Consequence) Results demonstrate the susceptibility of bacteria to antibiotics, for use against pathogen in vivo

(Next Action) Report susceptibility findings to requesting physician

KNOWLEDGES AND SKILLS

Growth requirements of bacteria
Principles and procedures of disc and tube antimicrobial susceptibility testing
Quality control testing
Selection of isolated colonies for sensitivity testing
Use of serial dilution
Technique to spread inoculated broth on plate
Antibiotic nomenclature
Application of disc to proper media
Proper incubation for antibiotic susceptibility testing

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Microbiology

MODULE 10: BACTERIOLOGIC DECONTAMINATION

TASKS

a. Test autoclave effectiveness with culture strips or ampules
b. Dispose of hazardous material, e.g., cultures/acids
c. Disinfect instruments/materials/ equipment

PERFORMANCE OBJECTIVE

(Stimulus)	Specimen request for microbiologic disposal or disinfection, and a check for effective decontamination by autoclaving
(Behavior)	The CLA will properly prepare and safely dispose of hazardous materials, disinfect work areas and equipment and test effectiveness of autoclave
(Conditions)	With periodic contamination checks by medical technologist or bacteriologist; utilizing appropriate autoclave (gas, heat, steam), exhaust hood and disinfectants
(Criteria)	Upon technical review sterility checks of autoclave, cultures of materials and equipment are judged correctly decontaminated and/or disinfected according to standard operating protocol
(Consequence)	Consistently valid decontamination of bacteria for safe and well maintained working conditions
(Next Action)	Dispose of sterilized microbiologic materials and follow-up decontamination if warranted

KNOWLEDGES AND SKILLS

Bacterial sterilization techniques
Proper methods for disposal of contaminated materials
Disinfectants' action
Danger of accidental infections
Consequences of contamination
Operation of autoclave
Use of culture or spore strips
Use of bacteriologic hood
Use of disinfectants on equipment
Procedures for handling contaminated materials

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

COMPETENCY UNIT III: URINALYSIS

This unit includes the following Module:

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Urinalysis

MODULE 1: ROUTINE URINALYSIS

TASKS

a. Determine color and clarity of urine by visual inspection
b. Determine specific gravity of urine
c. Determine pH of urine
d. Determine presence and concentration (semi-quantitative estimate) of protein in urine
e. Determine presence and concentration (semiquantitative estimate) of reducing substances in urine
f. Determine presence and concentration (semiquantitative estimate) of glucose in urine
g. Determine presence and concentration (semiquantitative estimate) of ketone bodies in urine
h. Determine presence and concentration (semiquantitative estimate) of blood in urine
i. Determine presence and concentration (semiquantitative estimate) of bile in urine
j. Identify and semiquantitate (estimate number per high power/low power field) organized substances on slide preparation of urinary sediment by microscopic examination
k. Identify unorganized substances on slide preparation of urinary sediment by microscopic examination
l. Prepare report of results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of urine specimen and test request
(Behavior)	The CLA will perform routine urinalysis
(Conditions)	With limited supervision; using refractometer, urinometer, centrifuge, microscope, glass slides and cover slips, commercial reagents, control specimens and procedure manual
(Criteria)	Control specimens produce expected results
(Consequence)	Valid report of semiquantitative results on appropriate form
(Next Action)	Report physiologically incompatible results to laboratory supervisor; report results to requesting physician

KNOWLEDGES AND SKILLS

Types of urine specimens (timed, random, early a.m., 24-hour) required, if any, for each task
Types of urine preferred, if any, for each task
Chemical and physical changes that occur in urine upon standing
Urine preservatives required/preferred, if any, for each task
Urine specimen collection techniques
Color of urine and variations of diagnostic significance
Causes of cloudy/milky appearance of urine
Reagent stability and methods of determining reagent potency
Technical precautions necessary to maintain reagent potency
Technical precautions necessary to achieve accurate and reproducible test results
Normal ranges for each test result
Physiologic incompatibilities of test results
Use and operation of refractometer, urinometer and centrifuge microscope
Recognition of microscopic morphology of elements found in urinary sediment
Recognition of microscopic morphology of common extraneous contaminants of urinary sediment

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

COMPETENCY UNIT IV: SEMEN ANALYSIS

This unit includes the following Module:

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Semen Analysis

MODULE 1: SEMEN ANALYSIS

TASKS

a. Determine presence of sperm in semen or other body fluid by microscopic examination
b. Determine viscosity of semen by visual inspection
c. Determine pH of semen
d. Determine volume of semen
e. Determine percentage of motile sperm in semen by microscopic examination
f. Determine percentage of abnormally formed sperm in semen by microscopic examination
g. Determine concentration (number per unit volume) of sperm in semen by microscopic examination

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of semen or other body fluid specimen and test request
(Behavior)	The CLA will analyze the specimen for the presence and/or adequacy of sperm
(Conditions)	With limited supervision; using microscope, hemacytometer, blood cell pipette, glass slides and cover slips, graduated cylinder or test tube, pH reagent strip, and procedure manual
(Criteria)	Technical review demonstrates accurate observation of morphology and physicochemical reactions
(Consequence)	Valid report or results on appropriate form
(Next Action)	Report results to laboratory supervisor and/or pathologist

KNOWLEDGES AND SKILLS

Semen collection techniques
Techniques to instruct patients in specimen collection procedures
Physical and chemical changes that occur in semen upon standing
Technical precautions necessary to achieve accurate and reproducible test results
Use, operation and dimensions of hemacytometer
Procedures for calculating number of sperm per unit volume from number of sperm counted
Calculation of percentages
Use and operation of microscope and blood cell pipette
Microscopic morphology of sperm

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Semen Analysis

MODULE 1: SEMEN ANALYSIS

TASKS

a. Determine presence of sperm in semen or other body fluid by microscopic examination
b. Determine viscosity of semen by visual inspection
c. Determine pH of semen
d. Determine volume of semen
e. Determine percentage of motile sperm in semen by microscopic examination
f. Determine percentage of abnormally formed sperm in semen by microscopic examination
g. Determine concentration (number per unit volume) of sperm in semen by microscopic examination

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of semen or other body fluid specimen and test request

(Behavior) The CLA will analyze the specimen for the presence and/or adequacy of sperm

(Conditions) With limited supervision; using microscope, hemacytometer, blood cell pipette, glass slides and cover slips, graduated cylinder or test tube, pH reagent strip, and procedure manual

(Criteria) Technical review demonstrates accurate observation of morphology and physicochemical reactions

(Consequence) Valid report or results on appropriate form

(Next Action) Report results to laboratory supervisor and/or pathologist

KNOWLEDGES AND SKILLS

Semen collection techniques
Techniques to instruct patients in specimen collection procedures
Physical and chemical changes that occur in semen upon standing
Technical precautions necessary to achieve accurate and reproducible test results
Use, operation and dimensions of hemacytometer
Procedures for calculating number of sperm per unit volume from number of sperm counted
Calculation of percentages
Use and operation of microscope and blood cell pipette
Microscopic morphology of sperm

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

COMPETENCY UNIT V: CHEMISTRY

This unit includes the following Modules:

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 1: PREPARATION OF SOLUTIONS AND REAGENTS

TASKS

a. Prepare percent solutions
b. Prepare saturated solutions
c. Prepare normal solutions
d. Prepare molar solutions
e. Prepare osmolal solutions
f. Convert units of solution concentrations, e.g., mg/ml to mEq/l
g. Prepare buffer solutions
h. Prepare primary standard solutions
i. Prepare secondary standard solutions
j. Check reagents against standards

PERFORMANCE OBJECTIVE

(Stimulus) Upon need for specific solutions for use in laboratory testing

(Behavior) The CLA will calculate amounts needed of each constituent, prepare solution, place in appropriate container with any needed preservative, label completely and store properly

(Conditions) With indirect supervision; using appropriate glassware, reagents, analytical or other balances, slide rule, graph paper, calculator, water still and demineralizer, vortex dessicator, indicators, pH meter, heat bath with magnetic stirrer, reference books and published manual

(Criteria) Titration against standards and/or evaluation in chemical procedure against current standards, controls and reagents. These are judged appropriate for use

(Consequence) Properly prepared solutions for clinical laboratory use

(Next Action) Properly store prepared reagents and use as required

KNOWLEDGES AND SKILLS

Calculation of equivalent weights, equations, proportions, atomic and molecular weights; normal, molar, osmolar, percent and saturated solutions
Solution stability, temperature requirements and dating
Calculation of concentration of stock reagents
Use of specific gravity for calculating concentration
Principles of graphing

Use of slide rule, calculator and log paper
Principles and techniques of distillation, demineralization and dessication
Use of vortex, heating bath, magnetic stirrer, distillation and deionizing apparatus, volumetric glassware, pipettes and analytical and other balances
Types of solutions
Use of pH meter and calibration with pH buffers
Gravimetric calibration of volumetric equipment
Special handling of liquids and chemicals to avoid contamination
Quantitative transfer of chemicals in flask
Effects of glassware contamination in reagent preparation
Use of burettes
Principles and techniques of meniscus reading
Physical and chemical properties of chemicals
Acid/base reactions and principles of acidimetry and alkalimetry
Molecular theory and chemical bonding
Use of metric system
Principles and procedures for reagent preparation
Identification of end point of titration
Burette standardization technique
Use of Handbook of Chemistry and Physics and Merck Index
Use of preservatives and storage techniques

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 2: LABORATORY SAFETY AND PREVENTIVE TECHNIQUES

TASKS

a. Perform routine safety inspections
b. Prepare and maintain antidote kit for poisonous, corrosive and caustic reagents
c. Clean and disinfect working area
d. Check compressed gas tanks for toxic vapors
e. Check equipment for electrical and radiation hazards
f. Do periodic mechanical safety checks on power-operated equipment
g. Dispose of caustic or contaminated material

PERFORMANCE OBJECTIVE

(Stimulus)	Routinely and following installation of power-operated equipment and/or administration of tests involving compressed gas, caustic, poisonous or corrosive reagents
(Behavior)	The CLA will perform routine safety inspections of laboratory and equipment, properly label contaminated material, disinfect work area, properly dispose of contaminated and toxic materials and check for toxic vapors. He will maintain an antidote kit and take preventive measures against improper handling of caustic, corrosive or poisonous reagents
(Conditions)	With direct supervision; using appropriate acid carriers, special containers for dirty glassware, disinfectant, shower and eye wash, fire blankets and extinguishers, leak detectors, explosion-proof containers and refrigerators
(Criteria)	Must be correctly performed with regard to current laboratory directives and fire department directives for safety precautions
(Consequence)	Reduction in laboratory associated accidents and injury, and prolongation of operational life of equipment
(Next Action)	Operation of testing equipment and use of reagents that are safe for laboratory personnel

KNOWLEDGES AND SKILLS

Proper handling of caustic materials
Techniques for mechanical safety inspection of power-operated equipment
Use of fire alarm, fire extinguishers, fire blankets, eye wash and shower
Proper handling of dirty glassware and needles
Use of compressed gas regulator and fume hood
Basic accident prevention measures
Safe storage and use of reagents including transport
Use and handling of chemicals with noxious fumes
Use of disinfectants
Use and maintenance of antidote kit
Procedures for routine safety inspections
Use of autoclave
Use of automatic pipettors, semiautomatic pipettors or bulbs for pipetting caustic, noxious or pathogenic material

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 3: SPECIMEN HANDLING AND PROCESSING

TASKS

a. Pick up and deliver chemistry specimens
b. Label/accession specimen containers, e.g., tubes, slides
c. Log specimens received
d. Centrifuge blood and separate serum or plasma
e. Measure, dispense, preserve lab specimen, e.g., in refrigerator for subsequent testing
f. Prepare/preserve non-tissue specimens for shipments

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of labeled specimen and request for specific chemical assays

(Behavior) The CLA will check proper identification of request and specimen; ascertain test to be performed and whether it is an emergency, log, accession specimen as appropriate, separate serum and plasma from cells and process specimen (e.g., refrigerate or freeze when needed, measure volume or aliquot specimen, etc.)

(Conditions) With indirect technical supervision; using appropriate centrifuge, refrigerator or other appropriate method of preservation, labels, log forms, disposable pipettes and test tubes and/or containers for shipment

(Criteria) Performed according to current laboratory directives for specimen processing

(Consequence) Properly processed, labeled and preserved specimens for chemical analysis

(Next Action) Deliver specimen to or use in chemical testing

KNOWLEDGES AND SKILLS

Use/operation of centrifuge
Consequence of serum contamination by cells and pigments
Specimen preservation and degradation factors
Type of testing requested and amount of sample needed to perform analysis
Handling of stat requests (emergency)
Specific containers and preservatives needed for requested laboratory testing
Use of specimen log
Type of sample needed (clotted blood, EDTA, plasma, etc.)
Centrifugation of blood specimens for instrument analysis
Sterile technique

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 4: OSMOLALITY DETERMINATION

TASKS
a. Standardize instrument with known standards
b. Measure urine and/or plasma osmolality
c. Measure osmolality of control specimen

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of labeled specimen and test request for osmolality
(Behavior) The CLA will standardize the instrument and measure the osmolality of the specimen and control
(Conditions) With indirect supervision; using the osmometer and instrument manual
(Criteria) Performed with accurate instrument standardization and adequate quality control values
(Consequence) Determination of total solute concentration
(Next Action) Refer abnormal results to supervisor and report results to requesting physician

KNOWLEDGES AND SKILLS

Normal values
Principles and techniques of an osmometer
Calibration and adjustment of an osmometer
Relationship between the density of specific solute molecules, their respective numbers in solution and the freezing point of the solution
Principle of potentiometry

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 5: AUTOMATED CONTINUOUS FLOW ANALYSIS

TASKS

a. Prepare standards
b. Prepare sample tray with standards, controls and specimen samples
c. Run samples through testing
d. Monitor for trouble
e. Record results

PERFORMANCE OBJECTIVE

(Stimulus) Upon direction of supervisor and after instrument is set and standardized for specific automated procedure(s)

(Behavior) The CLA will operate the Autoanalyzer and seek help when problems arise

(Conditions) With indirect supervision; using appropriate SMA 6/60, SMA 12/60, Autoanalyzer I, Autoanalyzer II, reagents, controls, standards and procedural manual; with aid of supervisor to set up the instrument, clean and maintain and review results

(Criteria) Correctly performed with regard to quality control procedure

(Consequence) Properly analyzed specimens

(Next Action) Record and refer results to supervisor for review before reporting to requesting physician

KNOWLEDGES AND SKILLS

Maintenance of sample integrity of air bubbles
Recognition of interaction between samples and instrumental drift
Importance of meticulous attention to kinetic parameters of continuous-flow analysis

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 6: SODIUM, POTASSIUM AND LITHIUM TESTING

TASKS

a. Use standards to adjust instrument
b. Determine sodium concentration of plasma/urine/serum
c. Determine potassium concentration of plasma/urine/serum
d. Determine lithium level of serum
e. Determine levels on control specimen

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of labeled and properly collected specimen and request for sodium and/or potassium or lithium testing on plasma, serum or urine

(Behavior) The CLA will prepare specimens, standardize-adjust instrument and measure the sodium and/or potassium or lithium levels of the specimen

(Conditions) With indirect supervision; using appropriate emission flame photometer (manual or automated), proper reagents and instrument manual and appropriate energy level setting

(Criteria) Judged correctly performed with regard to current laboratory procedures and quality control

(Consequence) Accurately measured sodium and/or potassium or lithium level

(Next Action) Refer results to supervisor for correlation with other electrolytes and report results to requesting physician

KNOWLEDGES AND SKILLS

Principles and operation of Autoanalyzer and flame emission photometer
Precautions and cleaning of instrument
Normal values and recognition of life-threatening results
Quality control and standardization of instrument
Importance of sodium and potassium in electrolyte balance
Effects of hemolysis, cigarette smoke, etc.

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 7: CHLORIDE LEVEL TESTING

TASKS

a. Standardize instrument or equipment with known standards
b. Determine chloride concentration of plasma/urine
c. Determine chloride concentration of control sample
d. Calculate chloride by manual method

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of labeled and properly collected specimen with request for chloride level

(Behavior) The CLA will prepare specimen, standardize chloridometer, chloride titrator, Autoanalyzer or other automated instrument, measure the chloride concentration and calculate results (if necessary)

(Conditions) With indirect supervision; using appropriate chloride titration apparatus, chloridometer, Autoanalyzer or other automated instrument, proper reagents and instrument manual

(Criteria) Correctly performed with regard to current laboratory procedures and quality controls

(Consequence) Accurately measured chloride content

(Next Action) Refer results to supervisor for correlation with other electrolytes before reporting results to requesting physician

KNOWLEDGES AND SKILLS

Changing values in mEq/l to mg/dl (deciliter)
Principles and reactions of Schales and Schales titration of chloride, chloridometer (coulometric) and Autoanalyzer
Normal values
Cleaning and maintenance of instruments
Quality control and standardization of instruments
Importance of chloride in electrolyte balance
Use of burette

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 8: CARBON DIOXIDE CONTENT

TASKS
a. Determine carbon dioxide content of serum/plasma
b. Determine carbon dioxide content of control specimen

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of labeled and properly collected specimen and request for carbon dioxide (CO_2) content
(Behavior)	The CLA will measure and calculate the level of carbon dioxide
(Conditions)	With indirect supervision; using appropriate carbon dioxide titration apparatus or gasometer and thermometer or Autoanalyzer and proper reagents
(Criteria)	Judged correct with regard to current laboratory procedures and quality control checks
(Consequence)	Accurately measured carbon dioxide content
(Next Action)	Refer results to supervisor for correlation with other electrolytes and report results to requesting physician

KNOWLEDGES AND SKILLS

Principles, reactions involved and operation of gasometer and Autoanalyzer
Calculation of carbon dioxide based on gas laws
Precautions with mercury
Effects of temperature, air and rbc on carbon dioxide level
Importance of carbon dioxide in electrolyte/acid-base balance

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 9: DETERMINATION OF HYDROGEN ION CONCENTRATION (pH)

TASKS

a. Prepare primary standards (acid-base)
b. Check and adjust pH of reagents and buffers
c. Determine H^+ concentration from electrode pH measurements
d. Determine pH units by interconversion of hydrogen ion concentrations in nanoequivalents per liter
e. Maintain pH equipment

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of specimen and request for pH determinations on blood, urine or laboratory solutions

(Behavior) The CLA will prepare primary standards when appropriate, check hydrogen ion concentrations of standards, controls and specimen; calculate and convert into pH units and properly maintain pH electrodes between determinations

(Conditions) With minimal technical supervision; using appropriate pH meters or blood gas instrument with pH electrode, standard buffers, controls, instrument manual and saline wash solutions

(Criteria) Correctly performed with regard to interrelationships between pH, hydrogen ion activity, the hydrogen ion activity coefficient and the hydrogen ion concentration

(Consequence) Accurate pH measurement

(Next Action) Record pH measurements and report back to requesting physician or supervisor

KNOWLEDGES AND SKILLS

Use and operation of pH meter
Theory and care of glass electrodes and reference electrodes
Preparation of standards to avoid contamination
Effects of temperature changes on pH
Ability to recognize problem exists with pH meter
Relationship of acid-base balance and pH
Determination of the H^+ ion concentration as the negative logarithm of the molal concentration
Normal acid-base values
Use of pH isobars in determining hydrogen ion concentration

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 10: BLOOD GAS DETERMINATION

TASKS

a. Do direct measurement of blood pCO_2
b. Calculate pCO_2 using a nomogram
c. Do direct measurement of blood pO_2
d. Calculate oxygen saturation percent nomogram for whole blood (pO_2)
e. Determine oxygen saturation using spectrophotometric measurements

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of heparinized blood and request for blood gas level determinations or a specific blood gas level
(Behavior)	The CLA will immediately measure and/or calculate pO_2/pCO_2 and O_2 saturation by direct electrode measurement or using a nomogram
(Conditions)	With indirect supervision; using appropriate meter and microliter electrode apparatus or blood gas instrument, i.e., Corning or IL, reagents, bottled O_2 and CO_2 gases and labeled blood specimen
(Criteria)	Accurately performed with regard to standard blood gas determination procedures
(Consequence)	Determination of blood gas levels
(Next Action)	Quickly report results to requesting physician, referring abnormals to supervisor

KNOWLEDGES AND SKILLS

Development of a linear acid-base nomogram
Principles of partial pressure and procedures for their calculation
Principles and operation of gas analyzer, e.g., micro-astrup
Normal values for arterial and venous partial pressures
Clinicopathologic correlation, e.g., respiratory alkalosis subsequent to administration of sodium bicarbonate; the effects and interrelationships of respiratory and metabolic treatment
Principles of use of compensated base to overcome acid-base imbalance

Maximum and minimum blood gas level values consistent with survival
Calculation of pCO_2 with alignment nomogram
Recognition of when the position of the sigmoid oxygen equilibrium curve is altered by pH
Relation of oxygen content, oxygen capacity and oxygen saturation to blood gas analysis

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 11: DETERMINATION OF GLUCOSE AND/OR OTHER CARBOHYDRATES

TASKS

a. Determine glucose concentration
b. Perform glucose on a standard solution
c. Perform glucose on a control sample
d. Record and report results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of properly labeled and collected cerebral spinal fluid specimen (fluoride if not analyzed immediately) and request for glucose level in serum, plasma, cerebral spinal fluid or urine

(Behavior) Depending on laboratory protocol, the CLA will quantitatively react the specimen with the appropriate reagents and measure the glucose level by spectrophotometric, colorimetric or automated technique

(Conditions) With indirect supervision; using appropriate reagents, glassware (pipettes); energy level of instrument, e.g., filter, wavelength setting; spectrophotometric, colorimetric or automated instruments, standards and controls

(Criteria) Correctly performed with regard to proper controls and procedural standards

(Consequence) Quantitation of glucose level in the specimen

(Next Action) Record, refer abnormal results to technical supervisor, report results immediately calling physician's attention to any serum or plasma level below 40 mg%

KNOWLEDGES AND SKILLS

Normal values by various techniques
Principles of operation of spectrophotometer and colorimeter
Use and standardization of reagents
Use of standardized calibrated spectrophotometer
Beer's Law
Principle of optically matched cuvettes and testing methods for calibration of cuvettes
Use of Autoanalyzer and multichannel system
Understanding of substances that cause interference
Use of pipettes
Use of control samples
Calculations based on relationship of absorbance and concentration

Principle of chemical measurement of glucose by reduction, condensation, hexokinase and glucose oxidase reactions
Specificity and stability of enzymes
Use and principle of various protein free filtrates, e.g., tungstic acid, $Ba(OH)_2$ and $ZnSO_4$
Principle and methods of tolerance tests
Chemical characteristics and reactivity of galactose, lactose and xylose
Basic carbohydrate metabolism
Recognition that problem exists or help is needed

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 12: TOLERANCE TESTS

TASKS

a. Draw fasting blood from patient
b. Administer oral glucose, galactose or other material
c. Collect blood/urine specimens at timed intervals

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of requisition for a tolerance test

(Behavior) The CLA will collect a fasting blood specimen, make sure fasting urine is collected, administer the appropriate amount of glucose or other material and collect blood and urine specimens at timed intervals

(Conditions) With indirect supervision; using alcohol sponge, tourniquet, vacutainer, needle adaptor or needle and syringe, tubes with and without anticoagulants, appropriate reagents, pipettes, spectrophotometric, colorimetric or automated instruments, standards and controls

(Criteria) Correctly performed according to procedural standards

(Consequence) Specimens collected for analysis of tolerance

(Next Action) Send specimens to laboratory and performance of chemical examination

KNOWLEDGES AND SKILLS

Blood collection techniques
Principles and precautions with tolerance testing
Calculation of quantity of glucose, galactose, etc. to give patient

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 13: URIC ACID TEST

TASKS
a. Determine concentration of uric acid on serum
b. Perform uric acid test on standard solution
c. Determine uric acid on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a properly collected and labeled specimen and request for uric acid level in serum
(Behavior)	The CLA will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure spectrophotometrical or by automated procedure
(Conditions)	With indirect supervision; using the appropriate controls, standards, reagents, qlassware, spectrophotometer, colorimeter or Autoanalyzer system
(Criteria)	Performed according to standard laboratory procedure, control values in the laboratory's accepted range and procedural standards
(Consequence)	Quantitation of uric acid
(Next Action)	Record, dilute specimen and repeat any test too high to read, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and techniques of chemical measurement of uric acid by reduction methods and enzyme methods
Stability of specimen
Principle and use of protein-free filtrates

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 14: UREA (BLOOD UREA NITROGEN) DETERMINATION

TASKS

a. Determine concentration of urea in serum or urine
b. Perform urea (or nitrogen) test on a standard solution
c. Determine urea on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for urea level in serum or urine

(Behavior) The CLA will measure total urine volume, quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol, and measure spectrophotometrically or by automated methods

(Conditions) With indirect supervision; using the appropriate controls, standards, reagents, glassware, heat bath, spectrophotometer, colorimeter, or Autoanalyzer system and equipment

(Criteria) Judged correctly performed based on standard laboratory procedure, control values in the laboratory's accepted range and procedural standards

(Consequence) Quantitation of urea

(Next Action) Record, dilute specimen and repeat any test too high to read, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and method of chemical measurement of urea by nesslerization, Berthelot (formation of indophenol blue), and direct reaction with diacetyl
Breakdown of urea by bacterial action
Enzyme specificity
Principle and use of protein-free filtrates

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 15: CREATININE DETERMINATION

TASKS

a. Determine concentration of creatinine in serum and/or urine
b. Perform creatinine on a standard solution
c. Determine creatinine on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for creatinine level in serum and/or urine

(Behavior) The CLA will measure total urine volume, when appropriate, quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure creatinine spectrophotometrically or by automated method

(Conditions) With indirect supervision; using the appropriate controls, standards, reagents, glassware, heat baths, spectrophotometer, colorimeter or Autoanalyzer system

(Criteria) Judged correctly performed based on standard laboratory procedures, control values in the laboratory's accepted range and procedural standards

(Consequence) Quantitation of creatinine

(Next Action) Record, dilute specimen and repeat any value out of sensitivity range of procedure, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and method of chemical measurement of creatinine by formation of picrate tautomer
Stability of specimen
Stability of creatinine levels in normal individual
Principle and use of protein-free filtrates
Clearance tests
Effects of hemolysis

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 16: AMMONIA DETERMINATION

TASKS
a. Determine concentration of blood ammonia
b. Perform ammonia test on a standard solution
c. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a properly collected and labeled specimen and request for ammonia level in whole blood or plasma
(Behavior)	The CLA will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure by titration, spectrophotometric or fluorometric method
(Conditions)	With indirect supervision; using the appropriate standards, reagents, glassware and spectrophotometer or fluorometer
(Criteria)	Performed quickly after specimen is received and correctly according to procedural standards
(Consequence)	Quantitation of ammonia
(Next Action)	Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer
Understanding of substances that cause interference
Principles, limitations and method of chemical measurement of ammonia by Conway diffusion, nesslerization, titration, ion exchange resin, Berthelot reaction and fluorescent glutamic dehydrogenase method
Necessity of working with everything cold and and running procedure immediately after specimen is drawn
Problems of ammonia contamination

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 17: PSP-PHENOLSULFONPHTHALEIN DETERMINATION

TASKS

a. Measure individual urine volumes
b. Determine concentration of phenolsulfonphthalein in urine
c. Perform phenolsulfonphthalein test on a standard solution
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of properly collected and labeled specimen and request for phenolsulfonphthalein level
(Behavior)	The CLA will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure phenolsulfonphthalein spectrophotometrically
(Conditions)	With indirect supervision; using the appropriate reagents, glassware and spectrophotometer
(Criteria)	Judged correctly performed based on procedural standards
(Consequence)	Quantitation of phenolsulfonphthalein
(Next Action)	Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and method of chemical measurement of phenolsulfonphthalein by alkalinization

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 18: SCREENING FOR PORPHYRIN AND RELATED COMPOUNDS

TASKS
a. Do screening test for urobilinogen
b. Do screening test for porphobilinogen
c. Do screening test for porphyrins

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled urine specimen and request for urobilinogen, porphobilinogen and/or porphyrins

(Behavior) The CLA will measure the specified compound by chemical means

(Conditions) Without supervision; using the appropriate reagents, glassware and ultraviolet light source

(Criteria) Judged correctly performed based on standard laboratory procedures; performing the urobilinogen before it is oxidized by light

(Consequence) Determination of presence of urobilinogen, porphobilinogen and/or porphyrins

(Next Action) Record, report, and, if positive for presence of compounds, consult with supervisor or pathologist if quantitation needed

KNOWLEDGES AND SKILLS

Principles and techniques of measurement of porphyrin and related compounds
Use of ultraviolet light source (Wood's light)
Precaution, e.g., bilirubin, hemoglobin letting set for any length of time
Simple extraction principles

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 19: TOTAL PROTEIN LEVEL

TASKS

a. Determine concentration of total protein in serum, urine or cerebral spinal fluid
b. Perform total protein on a standard solution
c. Determine total protein on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a properly collected and labeled specimen and request for total protein level in serum, urine, cerebral spinal fluid or other body fluids
(Behavior)	The CLA will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure, spectrophotometrically, by automated procedure or by refractive index
(Conditions)	With indirect supervision; using the appropriate controls,standards, reagents, glassware, spectrophotometer, heat bath and vortex mixer or refractometer or Autoanalyzer system and equipment
(Criteria)	Judged correctly performed based on standard laboratory procedure, control values in the laboratory's accepted range and procedural standards
(Consequence)	Quantitation of total protein in specimen
(Next Action)	Record, repeat any high urine or cerebral spinal fluid levels using a less sensitive method, e.g., Biuret, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles and limitations of chemical measurement of total protein by precipitation methods and Biuret method
Sterile technique with cerebral spinal fluid for CLA's protection
Principle and limitation of refractometer
Calibration and adjustment of spectrophotometer

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 20: MISCELLANEOUS SPECIFIC PROTEIN TESTS

TASKS
a. Determine presence of mucoproteins
b. Determine presence of cryoglobulins

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request and sample for mucoproteins and/or cryoglobulins in serum
(Behavior) The CLA will perform procedure for the specific protein
(Conditions) Without supervision; using appropriate glassware, reagents and equipment, e.g., centrifuge, water bath, refrigerator
(Criteria) Judged valid based on laboratory procedure
(Consequence) Determination of presence or semiquantitation of mucoprotein and/or cryoglobulins
(Next Action) Report results

KNOWLEDGES AND SKILLS

Principle of measurement
Properties of cryoglobulins and mucoproteins

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 21: FLOCCULATION TESTS

TASKS
a. Perform thymol turbidity assays
b. Perform cephalin-cholesterol flocculation tests (CCFT)

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of specimens and requests for cephalin-cholesterol flocculation or thymol turbidity tests
(Behavior) The CLA will perform specified analysis
(Conditions) Without supervision; using suitable spectrophotometric equipment, buffer solutions, glassware, controls and standards
(Criteria) Upon critical review is found correctly performed with regard to manual procedures, quality control and applicability to specific clinical problems
(Consequence) Quantitative estimation of abnormal serum proteins
(Next Action) Record and report findings to requesting physician

KNOWLEDGES AND SKILLS

Normal and abnormal values of serum protein
Techniques of salting out gamma globulins and measuring turbidimetrically
Principle reactions involved in each assay
Properties that inhibit flocculation and turbidity tests
Use of flocculation of serum protein assay for diagnosis of hepatic function

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 22: BILIRUBIN TEST

TASKS

a. Determine bilirubin concentration on serum or amniotic fluid
b. Perform bilirubin on a standard
c. Perform bilirubin on control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for bilirubin or fractionated bilirubin level in serum or amniotic fluid

(Behavior) The CLA will react the specimen with the appropriate reagents, depending on laboratory protocol, and measure by spectrophotometric or automated procedure or measure by direct spectrophotometric method where applicable and/or perform calibration curve when appropriate and standard not used

(Conditions) With indirect supervision; using appropriate reagents, glassware, spectrophotometer, Autoanalyzer, standards or graphs, controls

(Criteria) Performed according to standard laboratory procedure and control values in established laboratory range, without exposure to light and shortly after receiving specimen

(Consequence) Quantitation of bilirubin in the specimen

(Next Action) Record, refer abnormal results to technical supervisor for correlation and verification, and report, immediately calling physician's attention to any bilirubin on a newborn or any value greater than 2.0 mg%

KNOWLEDGES AND SKILLS

Approximate normal values
Principle limitations and method of direct spectrophotometric evaluation of bilirubin
Use of Autoanalyzer
Principles and techniques of chemical determination of bilirubin and fractionation of bilirubin by vario diazotization reactions, i.e., Evelyn and Malloy, Jendrassik-Grof
Understanding of interfering substances
Reasons to run bilirubin levels shortly after sample is obtained

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 23: BSP-BROMSULFOPHTHALEIN DETERMINATION

TASKS
a. Determine concentration of bromsulfophthalein
b. Perform bromsulfophthalein on a standard solution
c. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for bromsulfophthalein level in serum

(Behavior) The CLA will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure spectrophotometrically

(Conditions) With indirect supervision; using the appropriate standards, reagents, glassware, spectrophotometer, colorimeter and timing of collection

(Criteria) Performed according to standard laboratory procedures

(Consequence) Quantitation of bromsulfophthalein

(Next Action) Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values
Principles and operation of spectrophotometer
Understanding of substances that cause interference
Principle and method of chemical measurement of bromsulfophthalein
Effects of not collecting blood at proper time

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 24: CHOLESTEROL DETERMINATION

TASKS

a. Determine concentration of cholesterol
b. Perform cholesterol on a standard solution
c. Determine cholesterol on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a properly collected and labeled specimen and request for cholesterol level in serum
(Behavior)	The CLA will quantitatively react the specimen with the appropriate reagents depending on laboratory protocol and measure cholesterol by spectrophotometric or automated methods
(Conditions)	With indirect supervision; using the appropriate reagents, glassware, pipettors or bulbs, spectrophotometer or Autoanalyzer system, controls and standards
(Criteria)	Judged correctly performed based on control values in the laboratory's accepted range and procedural standards
(Consequence)	Quantitation of cholesterol
(Next Action)	Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference, e.g., hemolysis, bilirubin
Use of control samples
Principles, limitations, and methods of chemical measurements of cholesterol by Kantor-Zak and Liebermann-Burchard methods
Precaution with caustic agents

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 25: PHOSPHORUS (INORGANIC PHOSPHATE) DETERMINATION

TASKS

a. Determine concentration of phosphorus in serum or urine
b. Perform phosphorus on a standard solution
c. Determine phosphorus on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for phosphorus level in serum or urine

(Behavior) The CLA will measure total urine volume quantitatively, react the specimen with the appropriate reagents, depending on laboratory protocol and measure spectrophotometrically or by automated methods

(Conditions) With indirect supervision; using the appropriate controls, standards, reagents, glassware, heat baths, spectrophotometer, colorimeter or Autoanalyzer system and specimen free of hemolysis

(Criteria) Performed according to standard laboratory procedure, control values in the laboratory's accepted range and procedural standards

(Consequence) Quantitation of phosphorus

(Next Action) Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and methods of chemical measurement of phosphorus by reduction of phosphomolybdic acid
Principle of protein free filtrates
Effects of hemolysis, detergents
Calculation of TRP (tubular removal of PO_4)

Competency: CLINICAL LABORATORY ASSISTANT

Unit: Chemistry

MODULE 26: EXAMINATION OF CEREBROSPINAL FLUID (CSF) AND OTHER BODY FLUIDS AND SECRETIONS

TASKS

a. Perform gross and microscopic examination of spinal or other body fluid
b. Determine total protein concentration of spinal or other body fluid
c. Determine glucose concentration of spinal or other body fluid
d. Determine chloride concentration of spinal or other body fluid
e. Determine globulins in excess of amount normally present by precipitation method

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of specimen and request for examination and chemical assays of cerebrospinal fluid or other body fluids or secretions

(Behavior) The CLA will perform gross and microscopic analysis; determine protein, glucose, chloride and calcium concentrations; detect increase in globulins and lactate dehydrogenase, if any

(Conditions) With indirect supervision; using appropriate chloridometer, spectrophotometer, reagents, controls, water bath and standards

(Criteria) Performed according to current laboratory procedures and controls

(Consequence) Accurate measurement of the concentrations of substances of clinical interest in spinal or other body fluids

(Next Action) Calculate and report results; refer abnormalities to supervisor

KNOWLEDGES AND SKILLS

Relation of cerebrospinal fluid formation to the blood brain barrier
Normal values for lumbar cerebrospinal fluid in adults
Chemical alterations in CSF in disease
Relationship of cerebrospinal fluid function to protection, volume regulation and nutrition
Precautions when working with CSF

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Chemistry

MODULE 27: ANALYSIS OF URINARY CALCULI

TASKS

a. Observe and describe physical characteristics of urinary calculi, e.g., weight, size, shape, color, surface appearance, consistency
b. Determine calcium oxalate presence and/or concentration by chemical analysis
c. Determine uric acid and urate presence and/or concentration by chemical analysis
d. Determine calcium and magnesium phosphate presence and/or concentration by chemical analysis
e. Determine magnesium ammonium phosphate presence and/or concentration by chemical analysis
f. Determine calcium carbonate, cystine and xanthine constituent presence and/or concentrations by chemical analysis

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of specimen and request for analysis of the constituents of urinary calculi

(Behavior) The CLA will pulverize the stone in preparation for chemical analysis, perform the analysis in a systematic manner and record results

(Conditions) With minimal technical supervision; using appropriate balance, mortar and pestle, water bath, chemical reagents and controls

(Criteria) Performed according to current techniques and applicability in clinical diagnosis of diseases associated with crystalline precipitation

(Consequence) Determination of constituents present and/or concentrations as an indication of possible need for a further selective group of assays

(Next Action) Report to requesting physician

KNOWLEDGES AND SKILLS

Techniques to pulverize stones to a fine powder
Techniques to cut, saw or break stone to examine interior for color and texture
Principles and use of color reaction for qualitative testing

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

COMPETENCY UNIT VI: SEROLOGY

This unit includes the following Modules:

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Serology

MODULE 1: SERIAL DILUTIONS AND CELL SUSPENSIONS

TASKS
a. Prepare serial dilutions
b. Prepare cell suspensions

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a test request requiring a serologic procedure to obtain quantitative estimations of antigen or antibody count
(Behavior)	The CLA will prepare appropriate serial dilutions and/or cell suspensions to be utilized in the specified diagnostic testing
(Conditions)	With minimal technical supervision; utilizing appropriate glassware, equipment and specimens
(Criteria)	The dilutions and suspensions must be performed in accordance with procedures outlined in technical manuals; using correct pipetting technique
(Consequence)	Consistently accurate and systematic dilution of a fluid for diagnostic testing and/or consistently accurate preparation of appropriate cell suspensions
(Next Action)	Use serial dilutions and/or cell suspensions in the specified diagnostic tests

KNOWLEDGES AND SKILLS

Antigen and antibody reactions/concepts
Preparation of percent solutions and ratio dilutions
How to wash cells
Centrifugation techniques
Pipetting techniques
Choice of appropriate glassware

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Serology

MODULE 2: NON-TREPONEMAL SYPHILIS TESTING

TASKS

a. Interpret request slip for non-treponemal syphilis testing
b. Do non-treponemal syphilis tests (qualitative and quantitative)
c. Read and report results of non-treponemal testing

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request from medical officer for non-treponemal antibody (reagin) testing
(Behavior)	The CLA will perform qualitative and/or quantitative syphilis testing, and report results
(Conditions)	With limited technical supervision; utilizing appropriate glassware, reagents, equipment and properly prepared specimens
(Criteria)	Correctly performed with regard to pipetting technique, proper preparation of specimen, utilization of standard testing procedures as set by the National Communicable Disease Center, proper use of controls and implementation of quality control procedures, e.g., calibration of delivery needles, calibration of equipment. Quantitative non-treponemal testing is judged correctly performed with regard to the above criteria and to the technique of preparing twofold serial dilutions of the specimen
(Consequence)	Demonstration of consistent accuracy in non-treponemal testing for syphilis, employing the use of valid controls
(Next Action)	Determine if confirmatory treponemal testing is desired by pathologist

KNOWLEDGES AND SKILLS

Specimen preparation
Preparation of antigen suspensions of cardiolipin or lipoidal extracts, using commercially available reagents
Preparation and use of controls
Use of equipment, e.g., rotating machine, glass slides with ceramic rings, syringes with calibrated delivery needle
Quality control procedures (includes equipment and reagents)

Serial dilution technique
Clinical conditions giving possible false positive and/or negative test results
Operation and maintenance of quality control systems, including proper use of control sera with specific test procedures
Refrigeration and storage (shelf-life) conditions for test kits and/or reagents
Serologic reactions of sera with diagnostic reagents
Specific limits and precautions to be observed with various reagents

Competency: CLINICAL LABORATORY ASSISTANT (CLA)

Unit: Serology

MODULE 3: SERODIAGNOSTIC TESTING FOR DISEASES OTHER THAN SYPHILIS

TASKS

a. Do febrile agglutination testing (slide and/or tube method)
b. Do infectious mono testing by latex agglutination procedure
c. Do latex screen for C-reactive protein (CRP)
d. Do latex screen for rheumatoid factor (RA)
e. Do latex screen for thyroid antibodies
f. Do macroscopic slide agglutination test for leptospirosis
g. Do latex screening for systemic lupus erythematosus (SLE)
h. Do pregnancy tests (slide and/or tube methods)
i. Test for antistreptococcal hyaluronidase (AHT)
j. Do streptococcus MG agglutination

PERFORMANCE OBJECTIVE

(Stimulus) Upon receiving testing request for diagnostic determination of conditions other than syphilis

(Behavior) The CLA will perform the desired serologic testing procedure as per request

(Conditions) With limited technical supervision; using appropriate glassware, equipment, reagents, specimens, and control sera

(Criteria) Correctly performed with regard to pipetting technique, proper use of control sera, utilization of standard operating procedures as outlined in technical manuals and/or specific test kit directions and proper serial dilution technique (where appropriate)

(Consequence) Accurate and consistently valid testing for conditions other than syphilis as shown by test results of control sera

(Next Action) Report results and determine if additional testing is desired by pathologist

KNOWLEDGES AND SKILLS

Normal value requirements
Procedures for use with specific test kits, e.g., slide test for pregnancy, slide test for infectious mononucleosis, tube test for pregnancy, latex slide test for C-reactive protein, etc.

Prozone phenomenon
Recognition of prozone (zonal) reactions
Correlation of prozone reactions and need for quantitative testing of specimen
Use of test kits, e.g., RPR-rapid plasma reagin (circle) card test kits, microflocculation testing kits, including type of specimen required by kit
Clinical correlation
Confidential nature of information derived from this area of testing
Normal values
Conditions resulting in false positive non-treponemal testing results

MEDICAL LABORATORY

TECHNICIAN

TABLE OF CONTENTS

COMPETENCY CURRICULUM FOR

MEDICAL LABORATORY TECHNICIAN

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT I: HEMATOLOGY

This unit includes the following Modules:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Hematology

MODULE 1: SPECIAL PREPARATIONS AND STAINING TECHNIQUES

TASKS

a. Prepare stained specimens using supravital stain
b. Prepare special stains, e.g., leukocyte alkaline, phosphatase, peroxidase, Prussian blue, Periodic acid--Schiff, Feulgen, Ribonuclease, Deoxyribonuclease

PERFORMANCE OBJECTIVES

(Stimulus)	Upon receipt of request for specific special stain on blood sample
(Behavior)	The MLT will prepare specimen for requested staining procedure and stain
(Conditions)	With supervision; using glass slides, coverslips, test tubes, 37-degree-centrigrade incubator, stains, special reagents, manual of special stain techniques, coplin jars, volumetric flask, time clock, permanent mounting solution, labels, microscope
(Criteria)	Positive and negative controls should give appropriate results
(Consequence)	Specially stained specimen is prepared for interpretation by senior technologist or pathologist
(Next Action)	Submit specially stained specimen to senior technologist or pathologist for evaluation and interpretation

KNOWLEDGES AND SKILLS

Wet mount of blood
Theory and preparation of supravital stains
Theory and preparation of histochemical stains
Preparation of wet mounts
Application of coverslips

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Hematology

MODULE 2: ABNORMAL HEMOGLOBINS AND ABNORMAL HEMOGLOBIN COMPOUNDS

TASKS

a. Identify abnormal hemoglobin compounds spectroscopically
b. Prepare hemolysate
c. Perform alkali denaturation test for HbF
d. Perform hemoglobin electrophoresis
e. Perform ferrohemoglobin solubility test

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for identification of abnormal hemoglobins and abnormal hemoglobin compounds
(Behavior)	The MLT will identify the presence of abnormal hemoglobin compounds using the spectroscope, prepare hemolysate and perform alkali denaturation test, hemoglobin electrophoresis, and ferrohemoglobin solubility test
(Conditions)	With limited supervision; using spectroscope and particular reagents, centrifuge, tubes, vortex mixer, saline, toluene, filter paper, refrigerator, specified electrophoresis equipment and reagents, pipettes, spectrophotometer, stopwatch, potassium hydroxide, ammonium sulfate, phosphate buffers
(Criteria)	Obtain appropriate results with control specimens
(Consequence)	Detection and identification of abnormal hemoglobins and abnormal hemoglobin compounds, if present
(Next Action)	Report results if normal; submit abnormal results to supervising technologist for evaluation

KNOWLEDGES AND SKILLS

Methodologies for all above tests
Sources of error
Normal values
Operation of spectrophotometer
Operation of electrophoresis equipment

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Hematology

MODULE 3: ABNORMAL ERYTHROCYTE HEMOLYSIS

TASKS

a. Perform osmotic fragility test
b. Perform test for paroxysmal nocturnal hemoglobinuria (PNH)
c. Perform test for paroxysmal cold hemoglobinuria (PCH)
d. Perform screening tests for deficiencies of pyruvate kinase (PK), glucose-6-phosphate dehydrogenase (G-6-PD), glutathione reductase (GSSG-R), reduced glutathione (GSH) and triosephosphate isomerase (TPI)

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specific test request for abnormal erythrocyte hemolysis determination
(Behavior)	The MLT will determine whether abnormal erythrocyte hemolysis can be demonstrated by performing any or all of the following tests: osmotic fragility, PNH, PCH, screening for deficiencies of PK, G-6-PD, GSSG-R, GSH and TPI
(Conditions)	With supervision; using needle and syringe, diluted saline, test tubes and rack, 37-degree-centrigrade incubator, refrigerator, specific reagents for each test, filter paper and long-wave ultraviolet light
(Criteria)	Must obtain appropriate results with control specimens
(Consequence)	Presence and cause of abnormal erythrocyte hemolysis is determined within the limitations of the methodologies employed
(Next Action)	Report normal results. Submit abnormal results to supervising technologist for evaluation

KNOWLEDGES AND SKILLS

Methodologies for all tests used above
Sources of error
Normal values
Reading and interpreting osmotic fragility curve
Setting up serial dilutions of saline
Use of long-wave ultraviolet light

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Hematology

MODULE 4: DEFINITIVE COAGULATION PROCEDURES

TASKS

a. Perform prothrombin consumption time test
b. Determine plasma recalcification time
c. Determine plasma cross-recalcification time
d. Perform thromboplastin generation time test
e. Perform factor assays
f. Perform platelet aggregation
g. Determine thrombin time
h. Perform urea solubility test
i. Perform differential prothrombin time
j. Perform euglobulin lysis time

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request for definitive coagulation studies

(Behavior) The MLT will perform any or all of the following tests as determined by pathologist: prothrombin consumption time, plasma recalcification and cross-recalcification times, thromboplastin generation time, factor assays, platelet aggregation, thrombin time, urea solubility, differential prothrombin time and euglobulin lysis time

(Conditions) With direct supervision by supervising technologist and limited supervision by pathologists; using proper reagents, disposable glassware, 37-degree-centrigrade water bath, aggregometer, stopwatches, appropriate automated coagulation analyzers

(Criteria) Duplicate determinations must reproduce within acceptable range, controls must be within appropriate range

(Consequence) Results obtained for each of the tests performed

(Next Action) Submit results to pathologist for evaluation and interpretation

KNOWLEDGES AND SKILLS

Methodologies for each of the tests
Importance of cleanliness of materials, accuracy and reproducibility
Sources of error
Normal values
Principles of operation of platelet aggregometer
Operation of platelet aggregometer

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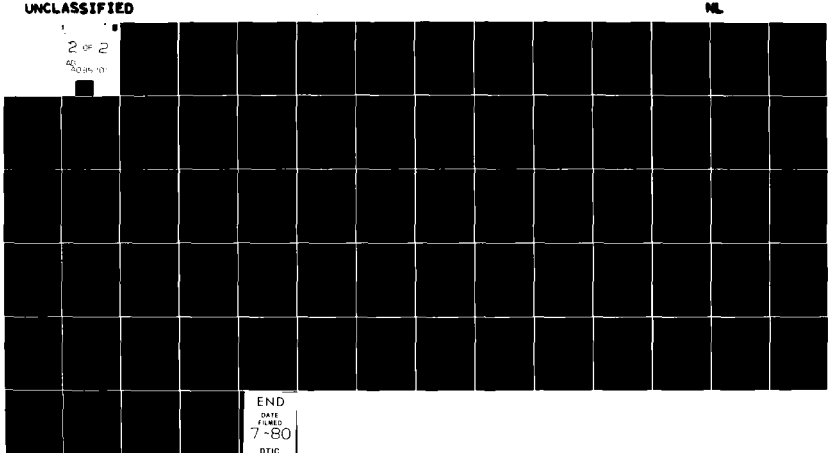

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Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Hematology

MODULE 5: BONE MARROW SMEAR PREPARATION AND STAINING

TASKS

a. Prepare bone marrow tray
b. Assist physician who is obtaining bone marrow specimen
c. Make bone marrow smears
d. Inject bone marrow specimen into culture tube
e. Place bone marrow biopsy specimen in preservative
f. Make peripheral blood smear
g. Deliver biopsy specimen to appropriate area for further processing
h. Fix and stain bone marrow and peripheral blood smears
i. Coverslip and label bone marrow and peripheral blood smears
j. Prepare special bone marrow stains

PERFORMANCE OBJECTIVE

(Stimulus) Upon request to prepare bone marrow specimen and biopsy for further processing

(Behavior) The MLT will prepare tray, assist physician at bedside, select aspirated marrow particles and smear, inject marrow specimen into culture tube when requested, place bone marrow biopsy specimen in preservative when requested, obtain peripheral blood smear, stain smears, coverslip and label and perform special staining if requested

(Conditions) Using bone marrow tray including needles, syringes, slides or coverslips, sterile aspiration and biopsy needles, local anesthetic, fixative, culture vials, alcohol swabs, lancets, iodine, preservative for biopsy specimen

(Criteria) Quality of prepared material must be suitable for interpretation by pathologist and cells properly distributed and stained

(Consequence) Bone marrow and peripheral blood smears are adequately prepared for examination by pathologist

(Next Action) Present bone marrow slides and peripheral blood smear to physician for interpretation

KNOWLEDGES AND SKILLS

Procurement of necessary materials for complete bone marrow analysis

MODULE 5 (Continued)

Techniques for marrow particle selection
from aspirated material
Techniques for smearing and staining particles
for optimal morphology
Special staining techniques
Cover slipping and labeling

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT II: MICROBIOLOGY

This unit includes the following Modules:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 1: QUALITY CONTROL OF BACTERIOLOGIC MEDIA

TASKS

a. Prepare quality control cultures to monitor media and reagents
b. Run control tests to validate media
c. Monitor susceptibility testing methods with control strains

PERFORMANCE OBJECTIVE

(Stimulus)	Routinely, upon receiving commercial media or after preparation of dehydrated media prior to use in bacteriology department
(Behavior)	The MLT will validate culture media by testing with known control reagent and stock cultures
(Conditions)	With technical supervision; using refrigerator, incubator, platinum loop, stock cultures, gas flame, control reagents and media to be tested; utilizing appropriate laboratory protocol
(Criteria)	Correctly performed with regard to the control culture reaction, which assures batch and commercial media consistency to support proper growth, colony counts and correct reactions
(Consequence)	Correctly reacting media for diagnostic use
(Next Action)	Store media in refrigerator prior to use

KNOWLEDGES AND SKILLS

Growth requirements for various microorganisms
Application of quality control monitoring to numerical data
Monitoring of sterilizers and autoclaves
Expiration dates of reagents and media
Inoculation of culture plates
Differentiation between desired growth and contamination
Preparation and storage of stock cultures

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 2: TESTS FOR BACTERIAL PATHOGENICITY

TASKS

a. Identify pathogenic beta hemolytic streptococci using Bacitracin discs, e.g., A discs
b. Do coagulase test to identify pathogenic staphylococci
c. Identify pneumococcus by optochin discs, e.g., P discs
d. Test for bacterial toxins by in vitro methods
e. Do counter immunoelectrophoresis and immunofluorescence test for rapid identification of pathogenic bacteria
f. Identify Hemophilus using X and V factors

PERFORMANCE OBJECTIVE

(Stimulus)	Specimen received and a culture requested for suspected pathogenic organism or toxin
(Behavior)	The MLT will perform tests for the detection and determination of the pathogenicity of the bacteria following established laboratory protocol
(Conditions)	With limited supervision utilizing appropriate discs and media, human plasma or sera, incubator, fluorescent microscope and electrophoresis apparatus
(Criteria)	Accurate identification of pathogens and toxins
(Consequence)	Positive determination of the pathogenicity of the organism and/or presence of toxins
(Next Action)	Report results and run sensitivities if warranted

KNOWLEDGES AND SKILLS

Growth requirements of bacteria
Principles and techniques of fluorescent microscopy
Principles and techniques of electrophoresis
Use and operation of electrophoretic apparatus
Antigen-antibody reaction
Colonial morphology
Use of flamed loop to isolate pure cultures
Use of antisera
Use of discs impregnated with chemicals for identification of streptococci and pneumococci
Use of coagulase plasma in identification of pathogenic staphylococci

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 3: SPECIAL PURPOSE STAINING FOR BACTERIA IDENTIFICATION

TASKS

a. Prepare flagellar stained specimens (Leifson)
b. Prepare capsular stained specimens (Hiss or Muir's method)
c. Prepare spore stained specimens (Schaeffer and Fulton's)
d. Prepare spirochetes stained specimens (Fontana)

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specimen and request for special bacteria staining and interpretation
(Behavior)	The MLT will perform the desired staining method and examine slide for gram-negative or -positive cocci or bacilli with location and number of flagella; presence of capsules or spirochetes; and location and size of spore, either intra- or extracellular
(Conditions)	Under the direct supervision of the microbiologist; using the appropriate staining reagents, microscope, glass slides, gas flamer for fixing, washing solution
(Criteria)	Performed in accordance with quality control and standard staining procedures or modifications
(Consequence)	Determination of morphologic characteristics of the microorganism
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Microscopic bacterial morphology with various stains
Principles of preparation and use of stains
Determination of correct usage of special stains

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 4: TESTS FOR IDENTIFICATION OF MYCOBACTERIA (AFB)

TASKS

a. Concentrate specimen for TB testing
b. Screen for AFB using acid-fast stains
c. Determine presence of AFB using culture techniques
d. Identify/confirm TB using biochemical/serologic techniques
e. Perform antimicrobial susceptibility of AFB

PERFORMANCE OBJECTIVE

(Stimulus)	Upon request and receipt of specimen for mycobacteria culture
(Behavior)	The MLT will concentrate specimen, perform AFB stain, inoculate culture media and, if culture is AFB positive, perform biochemical/serologic and susceptibility testing on AFB found
(Conditions)	With limited technical supervision; in mycobacteria isolation room; using appropriate bacteriologic hood, shaker, screw top tubes, glass slides, reagents for concentration, acid-fast stain, AFB culture media and incubators
(Criteria)	Performed in accordance with quality control and standard safety precautions and procedures, and according to standardized laboratory protocol
(Consequence)	Isolation and identification of AFB found and its antimicrobial susceptibility
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Safety precautions
Growth requirements of AFB
Staining and colonial morphology of AFB saprophytes
Use of bacteriologic hood
Preparation and staining of slides for AFB
Inoculation of AFB media
Biochemical tests used in identification of AFB
Concentration of specimens for AFB culture
Relationship of mycobacteria testing to monitoring of chemotherapy

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 5: MYCOLOGY TESTING

TASKS

a. Do KOH preps of fungal/yeast specimen
b. Determine presence of fungus using culture techniques
c. Determine presence of fungus using staining techniques
d. Demonstrate capsule by India ink method
e. Perform antimicrobial susceptibility testing of fungi
f. Demonstrate fungus by serologic techniques

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request and specimen for fungal culture and identification
(Behavior)	The MLT will culture the specimen to isolate and identify, if present, the etiologic agents of the superficial and/or cutaneous mycoses
(Conditions)	With supervision; using appropriate bacteriologic hood, incubators, standardized procedure for culture of mycologic specimens, KOH, glass slides, stains, India ink, antibiotics and serologic materials
(Criteria)	Performed in accordance with quality control and standard safety and procedural techniques
(Consequence)	Isolation and identification of fungi and their antimicrobial susceptibility, when requested
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Growth requirements for fungi and yeast
Culture and microscopic morphology of fungi and yeast
Safety precautions
Morphologic characteristics in vivo and in vitro
Recognition of fungi/yeast in KOH prep, stained specimen and culture
Antimicrobial susceptibility testing procedures for fungi
Assimilation and fermentation tests used in the identification of yeasts
Use of microculture for identification of fungi
Biochemical tests used for identification of fungi

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 6: PREPARATION OF VIRAL SPECIMENS

TASKS a. Preserve/freeze specimens for viral isolation

PERFORMANCE OBJECTIVE

(Stimulus)	Receipt of clinical specimen and request for viral isolation
(Behavior)	The MLT will prepare and pack specimen (with serologic material and clinical data) for shipment to virus laboratory
(Conditions)	Without supervision; using appropriate packing material, dry ice if needed, clinical data forms and acute or convalescent specimens
(Criteria)	Report from virus reference laboratory must indicate that specimen condition is appropriate for processing
(Consequence)	Viral specimen correctly packaged for shipping
(Next Action)	Send samples to virology laboratory for recovery and propagation testing

KNOWLEDGES AND SKILLS

Principles of specimen handling for viral specimens
Clinical background data for corroborative diagnosis
Serologic background samples for corroborative diagnosis
Labeling and identification of specimens for shipment
Clinical data forms

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 7: HOSPITAL INFECTION SURVEILLANCE AND PREVENTION

TASKS
a. Conduct epidemiologic studies
b. Evaluate effectiveness of preventive measures

PERFORMANCE OBJECTIVE

(Stimulus) Request for routine hospital micobiologic surveillance and preventive measures

(Behavior) The MLT will perform hospital infection studies and follow-up nosocomial infections

(Conditions) With supervision; using the appropriate incubators, swabs, tubes, culture media and standardized laboratory procedures for collection and processing of cultures

(Criteria) Differentiation between nosocomial infections and infections present upon admission

(Consequence) Reduction of hospital-caused infections

(Next Action) Report results to hospital infections committee

KNOWLEDGES AND SKILLS

Basic theory of nosocomial infections
Principles and procedures of sample collection for epidemiologic testing
Important sites for sample collection
Swab sampling techniques
Inoculation techniques
Differentiation between microorganisms that cause nosocomial infections and those that do not

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 8: COLLECTION OF SAMPLES FOR ROUTINE PREVENTIVE BACTERIOLOGIC TESTING

TASKS

a. Collect water samples from beach and stream bathing areas
b. Take samples of sewer effluent for analysis
c. Take food/water sample for bacterial/parasite testing
d. Take swab test samples from food and beverage outlet/containers
e. Take swab cultures from hospital equipment/floors
f. Prepare/preserve milk/water/food samples for shipment

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receiving a request for collection of bacteriologic samples for routine preventive testing
(Behavior)	The MLT will collect and prepare for culturing and/or shipment specimens related to hygiene and habitability for medical personnel and patients
(Conditions)	With limited technical supervision
(Criteria)	Proper collection and preservation of samples containing potentially infectious microorganisms; following standardized laboratory procedures
(Consequence)	Collection of samples containing potentially harmful microorganisms, if any
(Next Action)	Ship/inoculate/incubate specimens for identification

KNOWLEDGES AND SKILLS

Principles and techniques for collection and preservation of microorganisms
Growth requirements for microorganisms
Preservation of milk/food/water samples

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Microbiology

MODULE 9: ROUTINE PREVENTIVE BACTERIOLOGIC TESTING

TASKS

a. Do bacterial counts on hospital equipment
b. Do bacterial counts on environmental sample, e.g., air, soil
c. Do bacterial counts on water
d. Run bacteriologic tests on sewage
e. Do bacterial counts on food/milk

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specimen for preventive bacteriologic testing and request for a workup for identification of pathogenic bacteria, if present
(Behavior)	The MLT will inoculate and incubate appropriate cultures and check bacterial counts
(Conditions)	With minimal supervision; using colony counter and appropiate culture media
(Criteria)	Accurate identification of potential bacterial pathogens
(Consequence)	Determination of presence of potential bacterial pathogen
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Growth requirements of bacteria
Principles of food- and water-borne infections
Principles and use of colony counter
Dilution mathematics
Potential bacterial pathogens that may be found in surveillance cultures

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT III: URINALYSIS

This unit includes the following Module:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Urinalysis

MODULE 1: SPECIAL URINALYSIS

TASKS

a. Test urine for Bence-Jones protein (qualitative)
b. Stain and examine urinary sediment for oval fat bodies
c. Measure concentrating ability of kidney by concentration and dilution tests
d. Perform semiquantitative determination of phenylketones in urine
e. Determine presence of homogentisic acid in urine
f. Determine presence of melanin/melanogen in urine

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of urine specimen and test request(s)
(Behavior)	The MLT will perform specialized urinalyses
(Conditions)	With limited supervision; using refractometer, centrifuge, spectrophotometer, microscope, reagents, controls, special stains, glass slides and coverslips, control specimens and procedure manual
(Criteria)	Performed in accordance with quality control, technique and standard testing procedures
(Consequence)	Valid report of results on appropriate form
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Theory of renal function
Special stains and their uses
Principles and techniques of spectrophotometry, refractometry
Reagent stability and methods of determining reagent potency
Technical precautions necessary to maintain reagent potency
Technical precautions necessary to achieve accurate and reproducible test results
Normal ranges of each test result
Use and operation of pipettes, refractometer, centrifuge, spectrophotometer and microscope

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT IV: CHEMISTRY

This unit includes the following Modules:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 1: CHEMICAL STANDARDIZATION AND QUALITY CONTROL

TASKS

a. Prepare commercial or noncommercial chemical standards
b. Prepare reagent quality control materials
c. Run test standard to check accuracy of equipment
d. Monitor expiration-dated pharmaceuticals
e. Plot results/values

PERFORMANCE OBJECTIVE

(Stimulus)	Routinely or upon supervisor's orders
(Behavior)	The MLT will inventory, rotate supplies; prepare standard calibration curves and record quality control results
(Conditions)	With indirect supervision; using appropriate standards, controls, texts, established procedures, slide rule, quality control charts
(Criteria)	Performed in accordance with BuMed and local instructions concerning standard curve being consistent with Beer's Law and controls being ±2 S.D.
(Consequence)	Properly processed controls and reagents resulting in a reduction in laboratory errors
(Next Action)	Report valid results and refer problems to staff supervisor or pathologist

KNOWLEDGES AND SKILLS

Use of quality control logs and format charts
Use of slide rule and calculators
Principles and techniques of inventory control
Protocol for sensitivity check
Preparation and use of controls
Procedures to check instrument standardization
Preparation and use of standards

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 2: AUTOMATED CONTINUOUS FLOW ANALYSIS

TASKS

a. Prepare standards
b. Prepare sample tray with samples, controls and standards
c. Make dilutions on high results
d. Prepare appropriate reagent, sample and transmission lines
e. Make required settings
f. Check and record temperatures of heat baths
g. Phase and standardize instrument
h. Check for leaks
i. Check bubble pattern
j. Run samples
k. Make graphs and calculate results
l. Monitor for trouble
m. Record and report results
n. Clean instrument
o. Change pump tubing and dialyzer membranes

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a specimen and request for test that requires an automated procedure

(Behavior) The MLT will operate and maintain the Autoanalyzer system seeking help as needed, and make graphs and calculate results if needed

(Conditions) With indirect supervision; using appropriate SMA 6/60, SMA 12/60, Autoanalyzer I or Autoanalyzer II; proper tubing, reagents, controls, standards, cams, filters, dialysis membranes, flow cells, mixing coils, debubblers, nipple-connectors, heat baths and instrument manual

(Criteria) Performed according to quality control values and standard procedures

(Consequence) Properly analyzed specimens and maintained instruments

(Next Action) Record and refer results to supervisor for review before reporting; refer any troubleshooting problems to supervisor

KNOWLEDGES AND SKILLS

Use of automatic reagent delivery or sample measuring and delivery
Principles of continuous plotting of concentration ratio of the unknown against known standard

MODULE 2 (Continued)

Maintenance of sample integrity of air bubbles
Principles of dialysis and diffusion of constituents across the membrane into a recipient stream
Replacement of dialyzer membrane and tubing
Recognition of interaction between samples and instrumental drift; corrective techniques or refer to supervisor
Importance of meticulous attention to kinetic parameters of continuous-flow analysis

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 3: CLEARANCE TESTS

TASKS a. Calculate clearance of substance by kidnev

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of requisition for clearance test and receipt of values of constituent concentration in plasma and urine, total volume of urine, height and weight of patient
(Behavior)	The MLT will calculate the clearance
(Conditions)	With indirect supervision; using slide rule or calculator if necessary
(Criteria)	Upon review by supervisor judged correctly calculated
(Consequence)	Correctly calculated clearance
(Next Action)	Record and report results

KNOWLEDGES AND SKILLS

Mathematical calculation of clearance
Principle of clearance testing
Relationship of body surface area to blood volume and correction of clearance

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 4: PLASMA HEMOGLOBIN DETERMINATION

TASKS
a. Prepare standard for plasma hemoglobin
b. Determine plasma hemoglobin

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request and sample for plasma hemoglobin from physician or blood bank
(Behavior)	The MLT will determine the concentration of hemoglobin in the plasma
(Conditions)	Using a sample free of external hemolysis (drawn without trauma) and drawn with a heparinized syringe, processed properly according to procedures, use of appropriate timing, centrifuge, spectrophotometer, reagents and standards
(Criteria)	With indirect supervision; following procedural standards
(Consequence)	Accurate plasma hemoglobin concentration
(Next Action)	Dilute and repeat any values greater than sensitivity range of procedure, report result to physician or blood bank

KNOWLEDGES AND SKILLS

Normal and abnormal in vivo hemolytic process
Use of spectrophotometer, centrifuge
Principles, limitations, and method of chemical analysis of plasma hemoglobin based on hemoglobin's catalytic activity

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 5: SERUM IRON AND IRON BINDING CAPACITY

TASKS

a. Determine concentration of serum iron
b. Determine concentration of total iron binding capacity
c. Perform iron test on a standard solution
d. Determine iron on a control sample
e. Determine iron binding capacity on a control sample
f. Calculate results
g. Record and report results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for serum iron and/or total iron binding capacity level in serum

(Behavior) The MLT will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure spectrophotometrically or by automated technique

(Conditions) With indirect supervision; using the appropriate controls, standards, reagents, water bath, glassware, spectrophotometer and/or Autoanalyzer system

(Criteria) Performed according to procedural standards, using control values in the laboratory's accepted range

(Consequence) Quantitation of serum iron and total serum iron binding capacity

(Next Action) Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer, scintillation counter
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and method of chemical measurement of serum iron and iron binding capacity by bathophenanthrene reaction and competitive protein binding

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 6: TRIGLYCERIDE DETERMINATION

TASKS

a. Determine concentration of triglycerides
b. Perform triglyceride on a standard solution
c. Determine triglyceride on a control sample
d. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a properly collected and labeled specimen and request for triglyceride level in serum
(Behavior)	The MLT will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure spectrophotometrically or by automated methods
(Conditions)	With indirect supervision; using the appropriate controls, standards, reagents, glassware, heat baths, spectrophotometer or Autoanalyzer system, specimen from patient who has fasted for 12-14 hours
(Criteria)	Performed according to standard laboratory procedure and control values in the laboratory's accepted range
(Consequence)	Quantitation of triglyceride
(Next Action)	Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods
Principles and operation of spectrophotometer and Autoanalyzer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and methods of chemical measurement of triglycerides by enzymatic determination of glycerol or reaction of glycerol with periodate
Theory of lipid classification
Effect of fasting versus nonfasting specimen

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 7: CALCIUM-MAGNESIUM DETERMINATION

TASKS

a. Determine concentration of magnesium in serum
b. Determine concentration of calcium in serum and/or urine
c. Perform calcium on a standard solution
d. Perform magnesium on a standard solution
e. Determine calcium on a control sample
f. Determine magnesium on a control sample
g. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly collected and labeled specimen and request for calcium or magnesium level in serum or urine

(Behavior) The MLT will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol, and measure fluorometrically, spectrophotometrically, titrametrically, by automated methods or by atomic absorption

(Conditions) With indirect supervision; using the appropriate controls, standards, reagents, glassware, spectrophotometer, fluorometer, titrator or burette, atomic absorption spectrophotometer and gases or Autoanalyzer system

(Criteria) Based on control values in the laboratory's accepted range and procedural standards

(Consequence) Quantitation of calcium and quantitation of magnesium

(Next Action) Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values by various methods on adults and on children
Principles and methods of titration
Principles and operation of fluorometer, spectrophotometer, atomic absorption spectrophotometer
Principles and operation of Autoanalyzer

MODULE 7 (Continued)

Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and method of chemical measurement of calcium by redox titration, EDTA titration, chloranilate precipitation, Autoanalyzer and atomic absorption
Principles, limitations and method of determination of magnesium by fluorescent technique and atomic absorption spectrophotometry
Standardization of atomic absorption spectrophotometer
Standardization of fluorometer
Quenching problems in fluorometry
Lanthanum and strontium methods of removing interference in atomic absorption spectrophotometry
Role of vitamin D and parathyroid in calcium and phosphorus metabolism

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 8: COPPER STUDIES

TASKS
a. Perform copper concentration assays
b. Measure urine copper

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specimen and request for copper analysis
(Behavior)	The MLT will determine copper element levels
(Conditions)	With minimal technical supervision; using appropriate atomic absorption spectrophotometer, reagents, controls, spectrophotometric/colorimetric methods
(Criteria)	Performed according to standard procedures and quality control techniques
(Consequence)	Determination of copper concentration
(Next Action)	Record results and report to requesting physician

KNOWLEDGES AND SKILLS

Clinical symptoms that indicate abnormal copper levels
Use of copper for hemoglobin synthesis

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 9: ENZYMATIC DETERMINATIONS

TASKS

a. Determine acid phosphatase activity
b. Determine pseudocholinesterase activity
c. Determine hydroxybutyrate dehydrogenase activity (HBD)
d. Determine ceruloplasmin activity
e. Determine glucose-6-phosphate dehydrogenase (G-6-PD) activity
f. Determine pyruvate kinase (PK) activity
g. Determine aldolase activity
h. Determine proteolytic enzyme activity (trypsin)
i. Determine alkaline phosphatase activity
j. Determine glutamic pyruvic transaminase (GPT) activity
k. Determine glutamic oxalacetic transaminase (GOT) activity
l. Determine lactic dehydrogenase (LDH) activity
m. Determine amylase activity
n. Determine creatine phosphokinase (CPK) activity
o. Determine cholinesterase activity
p. Determine urine amylase activity
q. Determine nonroutine enzymes, e.g., isocitric dehydrogenase (ICD), leucine aminopeptidase (LAP)
r. Determine enzyme activity of control specimen
s. Do a calibration curve

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specimen and request for a specific enzyme determination
(Behavior)	The MLT will perform analysis of specific enzymes to determine activity and make a calibration curve when necessary
(Conditions)	With indirect technical supervision; using appropriate colorimetric/spectrophotometric instruments, reagents, timing devices, thermostated water bath or Autoanalyzer systems and controls
(Criteria)	Performed according to serum enzymology procedures, quality control and applicability to specific clinical situation
(Consequence)	Quantitative determination of enzyme activity

MODULE 9 (Continued)

(Next Action) Record, dilute specimen and repeat values out of range of zero order reaction rate, report and refer abnormal values to supervisor for correlation

KNOWLEDGES AND SKILLS

Principle of enzyme analysis, zero order reaction rates, effects of pH, temperature, substrate concentration, heavy metals, timing
Principle of chemical reaction of each of the enzyme tests
Interfering substances
Principle factors responsible for abnormal enzyme values
Clinical value of enzymatic determinations
Stability of enzymes

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 10: TOTAL AMINO ACID DETERMINATION

TASKS

a. Measure total volume of urine
b. Determine concentration of total amino acids in plasma or urine
c. Perform amino acid test on a standard solution
d. Determine amino acid concentration on a control sample
e. Calculate results

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of a properly collected and labeled specimen and request for total amino acid level in urine or plasma
(Behavior)	The MLT will quantitatively react the specimen with the appropriate reagents, depending on laboratory protocol and measure spectrophotometrically
(Conditions)	With indirect supervision; using the appropriate reagents, glassware and spectrophotometer
(Criteria)	Control values in the laboratory's accepted range; according to procedural standards
(Consequence)	Quantitation of amino acids
(Next Action)	Record, refer abnormal results to technical supervisor, report results

KNOWLEDGES AND SKILLS

Approximate normal values
Principles and operation of spectrophotometer
Use and standardization of standards
Understanding of substances that cause interference
Use of control samples
Principles, limitations and method of chemical measurement of amino acids by naphthoquinone sulfonate procedure and ninhydrin procedure

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 11: CHROMATOGRAPHY TESTS

TASKS

a. Perform column chromatography
b. Perform paper chromatography
c. Perform thin-layer chromatography (TLC)
d. Perform instant thin-layer chromatography (ITLC)
e. Perform ion-exchange chromatography

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of specimen and request for procedure requiring chromatographic testing
(Behavior)	The MLT will perform the appropriate chromatographic assay
(Conditions)	With direct supervision; using appropriate chromatographic apparatus, reagents and specimen
(Criteria)	Performed according to current chromatographic testing procedures and quality control requirements
(Consequence)	Identification and quantification of individual compounds; isolation and fractionation of specific compounds for screening purposes
(Next Action)	Report results; refer to supervisor for further action; identify individual compounds/elements

KNOWLEDGES AND SKILLS

Principles and techniques of chromatography
Understanding of chromatographic systems, i.e., liquid-liquid, liquid-solid
Principles of redeposition of compounds according to electrical charge and molecular size and shape
Principle for identifying and measuring carbohydrates
Principle for identifying and measuring amino acids

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 12: SALICYLATE-BROMIDE TESTING

TASKS

a. Screen urine for drug overdose of salicylates
b. Determine bromide concentration

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of blood, urine, body tissue or specimen of unknown source for identification and quantitation of salicylates or bromide levels above critical therapeutic levels
(Behavior)	The MLT will prepare specimen for chemical analysis, perform toxicologic analysis and preserve specimen for further testing
(Conditions)	With indirect supervision by toxicology staff; using spectrophotometer, specific chemical reagents, standards and controls
(Criteria)	Performed according to current techniques, procedures, quality control and applicability to definitive diagnosis of poisonous substances
(Consequence)	Proper identification and quantitation of suspected substances to ensure prompt and adequate treatment
(Next Action)	Report results immediately; notify toxicology supervisor if abnormal levels are present

KNOWLEDGES AND SKILLS

Choice of recommended specimens for specific toxicologic identification
Theory of pathways of salicylate elimination in the body

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Chemistry

MODULE 13: GASTRIC FUNCTION TESTS

TASKS

a. Examine appearance and measure volume of gastric juice
b. Determine pH, bile, mucus and blood content of gastric juices
c. Determine titratable acidity of gastric juice
d. Calculate free and total hydrochloric acid concentration
e. Determine pH of biliary/pancreatic secretions
f. Determine concentration of electrolytes in gastric secretions, e.g., bicarbonate, chloride, sodium, hydrogen

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of specimen and request for a specific analysis of gastric secretion

(Behavior) The MLT will determine pH, bile, mucus and blood content, if any, measure titratable acidity, concentration of electrolytes and/or perform specified gastric studies

(Conditions) With limited technical supervision; using appropriate test reagents and comparator block available in kits, pH meter, burette apparatus, standards, controls and microscope

(Criteria) Performed according to current laboratory procedures and quality control for gastric and duodenal content testing

(Consequence) Accurately measured gastric secretion or contents for clinical diagnosis and evaluation of therapy

(Next Action) Report results

KNOWLEDGES AND SKILLS

Use of microscope
Mechanisms and substances interfering with analysis, e.g., mucus, bile, blood
Theory, calculation and titration of acid-base reactions
Physiology and composition of gastric secretions
Nomenclature of gastric secretions relating to measurement
Principles and techniques of gastric function testing

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT V: SEROLOGY

This unit includes the following Modules:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Serology

MODULE 1: IMMUNOFLUORESCENCE TECHNIQUES

TASKS
a. Interpret test request involving fluorescent miscroscope technique
b. Perform immunofluorescent antibody testing

PERFORMANCE OBJECTIVE

(Stimulus)	Receipt of request and specimen for immunofluorescent testing
(Behavior)	The MLT will perform fluorescent antibody (FA) testing employing various techniques
(Conditions)	With limited technical supervision; using properly assembled fluorescent microscope equipment, reagents, control specimen and properly prepared and selected antigenic substrate, and using appropriate FA reference techniques
(Criteria)	Accurately performed with regard to use of proper techniques, quality control and standardization of procedures; the evaluation of the potency and specificity of the conjugate and antigenic substrates will give reproducible results
(Consequence)	Results will demonstrate diagnostic evidence (antibodies in autoimmune, viral, protozoal, bacterial, fungal diseases) for reliable, reproducible qualitative and quantitative testing
(Next Action)	Report results; determine if repeated testing or additional titers are needed

KNOWLEDGES AND SKILLS

Principles of fluorescence and factors affecting its demonstration
Principles and use of fluorescent microscope
Principles and techniques of various immunofluorescent techniques (i.e., direct and indirect)
Assembly and care of FA equipment
Safety precautions for working with FA equipment
Procedures for troubleshooting equipment
Preparation and selection of antigenic substrate
Serum dilution preparation
Conjugate characteristics, e.g., potency and specificity of commercially prepared fluorescein conjugated antisera

MODULE 1 (Continued)

Preparation and storage of reagents
Chessboard titration of conjugate to select a dilution affording the prescribed level of sensitivity and specificity
Quality control procedures
Recognition and interpretation of staining artifacts

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Serology

MODULE 2: SPECIFIC AND/OR CONFIRMATORY TREPONEMAL SYPHILIS SEROLOGY

TASKS
a. Interpret request slip for treponemal syphilis testing
b. Perform treponemal syphilis tests

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request for treponemal antibody testing

(Behavior) The MLT will perform treponemal examination as per request

(Conditions) With limited technical supervision; utilizing appropriate safety precautions to prevent self-infection, and using appropriate reagents, glassware, specimens and fluorescent microscope

(Criteria) Accurately performed with regard to technique, quality control and use of standard testing procedures for FTA-ABS, TPI, TRIA, TPA, TPMB, TPCF, RFTA, RPCF testing

(Consequence) Results will demonstrate diagnostic evidence for identification and consistently valid testing for syphilis

(Next Action) Report results and determine if repeat testing is desired

KNOWLEDGES AND SKILLS

Preparation of treponemal antigen to pick up specific antibodies
Safety procedures for handling infective materials
Interpretation of biologic false-positive reaction (BFP)
Preparation of specimen
Preparation of slides
Quality control procedures for reagents and techniques
Preparation of positive, negative and nonspecific controls
Preparation of reagent
Detection of Treponema pallidum by fluorescent-antibody dark-field technique
Serial dilution of specimens showing borderline reactions
Importance of confidentiality of information obtained through this type of testing

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Serology

MODULE 3: SEROLOGIC COMPLEMENT FIXATION TESTING

TASKS

a. Do complement fixation for Rickettsial identification
b. Do complement fixation for fungal identification
c. Do complement fixation for viral identification

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of request and specimen for CF testing

(Behavior) The MLT will perform the requested examination using the complement fixation (CF) procedure

(Conditions) With direct supervision; taking appropriate safety precautions with viral antigens; paying rigorous attention to details of test method, reagents and techniques, and using an approved CF procedure

(Criteria) Correctly performed with regard to standardization of procedures and technique, use of proper controls with performance of each test run, and reproducibility of test results as shown by a minimum of duplicate titers of the same serum

(Consequence) Reliable and reproducible results demonstrating identification of pathologic agent and specific antibody titer to aid in diagnosis

(Next Action) Report results and determine if paired sera testing is desired, or if additional titers and/or diagnostic testing is warranted

KNOWLEDGES AND SKILLS

Theory of complement fixation
Preparation of complement
Preparation of sensitized sheep cells (including attention to age and condition of cells, accurate percent cell suspension)
Preparation of antigen and standardization
Preparation of diluents, e.g., Veronal-buffered diluent (VBD), saline
Preparation and proper use of controls, e.g., serum control for AC activity, serum nonspecific antigen control, reagent controls, complement controls, hemolytic control and sheep cell control

MODULE 3 (Continued)

Performance of microtechnique or macromethod
Problems posed by anticomplementary sera
Conditions causing sera to be anticomplementary
Procedures for reading test results

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Serology

MODULE 4: HEMAGGLUTINATION TESTING FOR SEROLOGIC DIAGNOSIS

TASKS a. Do HA/IHA/HI for serologic microorganisms

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of specimen and request for HA testing

(Behavior) The MLT will perform the specific hemagglutination testing requested, e.g., toxoplasmosis, cold hemagglutinin testing, thyroid antibody testing, testing for rubella, mumps and influenza

(Conditions) With limited technical supervision; using approved technical procedures, commercially prepared testing kits and reagents and/or reagents available in the laboratory and appropriate glassware

(Criteria) Accurately performed with regard to proper use of controls, standardization of procedures and proper technique for HA/IHA/HI testing

(Consequence) Results will produce evidence to aid in diagnosis of diseases caused by specific microorganisms

(Next Action) Report results and determine if additional testing is required

KNOWLEDGES AND SKILLS

Macro and micro methods for hemagglutination testing
Basic concepts of hemagglutination and hemagglutination inhibition
Buffers for hemagglutination
Use of appropriate controls with test procedures
Procedures for use of test kits
Preparation of sensitized cells, including accurately prepared cell suspension as specified by test procedure
Clinical correlation of test results
Normal value requirements

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Serology

MODULE 5: IMMUNODIFFUSION ASSAYS

TASKS a. Perform immunodiffusion assays

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request and serum specimen for testing
(Behavior)	The MLT will perform immunodiffusion analysis on sera to determine presence of antigenic protein, e.g., ceruloplasmin, alpha-1-antitrypsin, alpha-fetoprotein or hepatitis australian antigen, and to determine specificity/nonspecificity of antigen present
(Conditions)	With supervision; using appropriate immunodiffusion equipment and procedures, proper control sera (standards), following safety precautions when handling potentially infectious materials
(Criteria)	Upon technical review is found correctly performed with regard to standardization of procedures, use of appropriate controls (standards), reagents and accurate technique
(Consequence)	Results will demonstrate the presence and specificity or nonspecificity of antigen, to aid in clinical diagnosis
(Next Action)	Report data to requesting physician following review by medical technologist or pathologist

KNOWLEDGES AND SKILLS

Principles of immunodiffusion
Preparation of required materials, e.g., agarose plates (if not purchased commercially), buffer, cutting of specimen wells in agarose, preservation of plates until used
Safety precautions to follow when handling potentially infectious materials
Recognition of patterns of reactions showing identity, partial identity, nonidentity of antigen and antibody

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT VI: BLOOD BANK

This unit includes the following Modules:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 1: ABO BLOOD GROUP TESTING

TASKS

a. Determine ABO forward (cell) group by slide method
b. Determine ABO forward (cell) group by test tube method
c. Perform ABO reverse (serum) grouping
d. Perform subgrouping technique of group A and AB blood
e. Determine ABH secretor status
f. Select group O donor blood for recipients of blood groups other than group O, for use in cases of emergency

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of properly identified specimen and request for determination of ABO blood group

(Behavior) The MLT will perform ABO forward (cell) grouping techniques, confirm ABO cell grouping by reverse (serum) grouping technique, determine subgroups of groups A and/or AB blood, if necessary to determine individual's ABO group; upon special request, determine the secretion of AB and/or H blood group substances in the saliva; in cases of emergency, perform tests to select group O donor blood for transfusion to recipients of other than group O

(Conditions) With minimal technical supervision; using commercial antisera and reagents and known A_1 and B cells, appropriate equipment, and/or automated blood typing instrument

(Criteria) Procedures are carried out according to accepted AABB standards, resulting in accurate detection of the antigens and/or antibodies of the ABO blood group system

(Consequence) Detection of antigens and antibodies of the ABO blood group to be used in determining an individual's ABO group, and/or subgroup of A or AB, and/or secretion of ABH substances in saliva for purposes of safe transfusion of blood and blood products (compatibility testing), processing of donor blood, prenatal studies, investigation of cases of hemolytic disease of the newborn, aid in identification of irregular antibodies

(Next Action) Determine Rh-Hr type

MODULE 1 (Continued)

KNOWLEDGES AND SKILLS

- Basic concepts of blood group antigens
- Basic concepts of blood group antibodies, e.g., principles of antibody production, immunoglobulin classes and relation of specific immunoglobulin classes to phases of antibody production
- Physical properties of antigen/antibody reactions, including effects of pH, time, temperature, ionic strength, electrical charge of red cell surface (Zeta potential)
- Inheritance patterns of the ABO blood groups
- Correlation of presence of ABO antigens on the red cell with presence of antibodies of this blood group system in the serum
- Theory of ABO reverse (serum) grouping procedure
- Various techniques for detection of ABO antigens on the red cell (slide and tube techniques)
- Concept and importance of the variance of strength of the A antigen as related to safe transfusion practice
- Use of plant agglutinins (lectins)
- Testing methods for subgroup of A
- Sources of error encountered in ABO forward (cell) and reverse grouping
- Principles of safe transfusion practice when using group O donor blood for transfusion to recipients of blood groups other than O
- Selection methods of group O donor blood for transfusion to recipients other than group O
- Testing methods for determination of secretion of ABH substances in saliva

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 2: DIRECT AND INDIRECT ANTIGLOBULIN (COOMBS') TESTING

TASKS

a. Perform direct Coombs' technique to detect red cells coated with antibody in vivo
b. Perform indirect Coombs' technique to detect red cells coated with antibody in vitro
c. Verify reactivity of antihuman globulin reagent by use of coated cell control

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of properly identified specimen and test request employing the use of the direct and/or indirect coombs' testing techniques

(Behavior) The MLT will perform direct and/or indirect Coombs' technique as required

(Conditions) With limited supervision; employing approved procedures of the AABB Technical Manual and laboratory procedure manual, using appropriate reagents and equipment (including automated cell washer if available), commercially prepared AHG, proper controls

(Criteria) Use of proper technique, appropriate controls, detection of in vivo or in vitro antibody coating of red cells if present

(Consequence) Detection of in vivo or in vitro antibody coating of red cells demonstrating an abnormal condition in the patient, the presence of an irregular antibody(s), presence of blood group antigens on red cells, compatibility or incompatibility of donor blood

(Next Action) Report results; record results in appropriate log book

KNOWLEDGES AND SKILLS

Principle of antihuman globulin (Coombs') technique
Principle of coated cell control
Concept of broad spectrum activity of Coombs' serum
Precise techniques in performance of direct/indirect Coombs' test
Uses of direct antihuman globulin technique
Uses of indirect antihuman globulin technique
Factors affecting the antiglobulin test
Sources of false positive and false negative Coombs' tests

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 3: RH-HR BLOOD GROUP TESTING

TASKS

a. Perform slide testing method for detection of Rho (D) antigen
b. Perform modified tube method for detection of Rho (D) antigen
c. Perform test for Rho variant (D^u)
d. Determine Rh phenotype by slide and/or modified tube technique
e. Determine most probable Rh genotype on basis of phenotype testing results

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of properly identified specimen and request for Rh typing

(Behavior) The MLT will perform Rh typing for Rho (D) antigen, including testing for Rho variant (D^u) when necessary to determine the Rh type of an individual; upon special request, will perform testing to determine Rh phenotype of an individual

(Conditions) With limited supervision; using commercially available antisera, appropriate equipment, proper controls and other necessary reagents

(Criteria) Done in accordance with accepted AABB procedures, using proper technique

(Consequence) Detection of Rh antigens and Rho (D) variant (D^u) on the red cells of an individual for use in donor blood processing, compatibility testing, prenatal studies, investigation of HDN, identification of irregular antibodies

(Next Action) Record results in appropriate laboratory log book and report results

KNOWLEDGES AND SKILLS

Two basic theories of inheritance of the Rh antigens
Fisher-Race and Wiener systems of nomenclature
Mosaic theory of the Rho (D) antigen
Theory of D^u as a weakened form of the D antigen, including theories of presence of D^u antigen on red cell
Rh testing techniques, including two types of antisera available (slide/modified tube and/or saline agglutinating serum), correlated with suspending medium of cells (serum or saline)

MODULE 3 (Continued)

Essential nature of using controls when performing tests
D^u testing procedures and use of negative control
Correlation of the Rh system and safe transfusion practices
Status of D^u positive individuals as blood donors and recipients
Meaning of Rh phenotype and use in predicting most probable Rh genotype
Antibodies of the Rh system, including immunoglobulin class, mode of reactivity
Use of Rh viewbox, optimum temperature of glass plate and slide used for testing

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 4: DETECTION AND IDENTIFICATION OF IRREGULAR ANTIBODIES

TASKS

a. Detection of irregular antibody with the use of group O reagent antibody detection (screening) cells
b. Identification of irregular antibody with use of a panel of group O reagent red cells (isoantibodies and/or autoantibodies)
c. Identification of multiple irregular antibodies in a specimen

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly labeled specimen and request or referral for detection and/or identification of irregular antibodies

(Behavior) The MLT will determine the presence or absence of irregular antibodies in the specimen; if present he will identify the antibody

(Conditions) With direct supervision; using reagent group O antibody detection and/or identification cells, appropriate equipment, proper controls, other necessary and appropriate reagents

(Criteria) Testing performed in accordance with approved technical methods, such as those outlined in AABB Technical Manual and other technical literature, with the use of appropriate controls

(Consequence) The detection and identification of irregular auto- and/or isoantibodies

(Next Action) Report results; if complexity of problem is beyond the scope of testing capabilities of laboratory, refer specimen to a competent reference laboratory for further testing

KNOWLEDGES AND SKILLS

Review of antibodies (production, immunoglobulin classes, optimum modes of reactivity, etc.)
Concept of dosage effect
Antibody detection test (purpose of test, what cells to be used, why such cells are chosen for this purpose, test procedure(s))
Antibody identification test (purpose of test, what cells chosen for use on antibody identification panel)

MODULE 4 (Continued)

- Explanation of "panel" of group O reagent antibody identification cells
- Correlation of antibody detection test results and antibody identification testing
- Use of an auto control
- Proteolytic enzymes (sources, mode of reaction, correlation to antibody identification studies, etc.)
- Concept of auto absorption when dealing with cold-reacting auto antibodies
- Various antibody identification techniques
- Use of cord blood cells
- Determination of antibody specificity from antibody detection and identification test results (use of panel data)
- Absorption and elution techniques
- Additional testing methods and procedures to be used in the presence of multiple antibodies
- Confirmation of antibody specificity by testing of patient's cells for presence of the corresponding antigen

Competency: MEDICAL LABO[illegible] (MLT)

Unit: Blood Bank

MODULE 5: TESTING FOR PRESENCE OR ABSENCE OF BLOOD CELL ANTIGENS OTHER THAN ABO AND RH SYSTEMS

TASKS a. Determine presence or absence of blood group antigens on red cells

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly identified specimen and request for testing for blood group antigens other than ABO and/or Rh blood group systems

(Behavior) The MLT will perform testing on blood donor and/or patient samples to demonstrate the presence or absence of blood group antigens

(Conditions) With technical supervision; using appropriate antisera, proper controls, other necessary reagents and proper equipment

(Criteria) In accordance with accepted procedures (AABB or commercial), employing appropriate controls

(Consequence) Determination of the presence or absence of blood group antigens other than ABO and Rh to aid in the identification of irregular antibodies, investigation of the probability and/or cause of HDN, identification of possibly compatible donor blood for recipients having irregular antibodies, identification of possible rare donors

(Next Action) Report results; record results in appropriate laboratory log book

KNOWLEDGES AND SKILLS

Blood group system and factors of each system
Nomenclature of the blood group systems and factors
Optimum reaction conditions for each antibody and its specific antigen
Testing procedures for blood group antigens
Statistical incidence of antigen in various populations
Dosage effect
Vital necessity of proper positive and negative controls when testing

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 6: COMPATIBILITY TESTING

TASKS

a. Identify patient for compatibility testing
b. Collect patient sample for crossmatching
c. Perform ABO and Rh typing on both donor and recipient
d. Perform antibody detection test on recipient
e. Select appropriate donor units for crossmatch
f. Perform compatibility testing
g. Complete compatibility and pretransfusion testing forms

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of orders for crossmatch
(Behavior)	The MLT will properly identify the patient, obtain a specimen of whole blood, perform ABO and Rh typing of donor and recipient, do antibody detection testing on recipient (and donor if not previously done), select appropriate donor units for crossmatch, perform compatibility testing, complete crossmatch and pretransfusion testing forms or records
(Conditions)	With limited supervision; using appropriate commercial reagents and equipment
(Criteria)	Compatibility and pretransfusion testing done by procedures approved by AABB and BuMed, giving utmost attention to all details of pretransfusion and compatibility testing procedures, using accurate techniques
(Consequence)	To provide the recipient with donor blood for transfusion that will offer maximum therapeutic benefit and minimize the threat of adverse effects of transfusion
(Next Action)	Have crossmatch approved by authorized personnel

KNOWLEDGES AND SKILLS

Rationale of crossmatch procedure definition of major and minor crossmatch
Proper identification of recipient
Typing of donor and recipient (ABO and Rh)
Design of crossmatch, including temperatures and relation of various antibodies that react optimally at these temperatures

MODULE 6 (Continued)

Procedures to be used when crossmatching in the presence of irregular antibodies (iso- and/or autoantibodies) including statistical probability of finding compatible blood in presence of a specific antibody
Use of emergency crossmatch procedure
Choosing appropriate donor units for requested transfusion, i.e., exchange transfusion, extracorporeal circulation, coagulation disorders, etc.
Donor blood anticoagulants used, including shelf life of each
Medicolegal aspects of transfusion of blood and blood products

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 7: NEONATAL STUDIES

TASKS

a. Perform ABO cell grouping and Rh typing on cord blood specimen
b. Do direct Coombs' test
c. Perform tests to determine the presence or absence of IgG forms of maternal antibody in cord serum
d. Perform elution technique for removal of antibody from infant's or cord sample coated cells
e. Identify antibody causing HDN
f. Choose compatible donor blood for exchange transfusion if necessary

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly identified specimen and request for cord blood testing

(Behavior) The MLT will perform ABO cell grouping, Rh typing, direct AHG test; if direct Coombs' test is positive, perform an elution on the infant or cord cells and identify the antibody coating the cells. In cases where the direct Coombs' test may be negative, and the possibility exists of an ABO incompatibility between infant and mother, perform testing to show absence or presence of IgG forms of Anti-A or Anti-B; choose compatible donor blood for exchange transfusion if necessary

(Conditions) With minimal technical supervision; using appropriate antisera, proper equipment, proper controls

(Criteria) Performed in accordance with accepted AABB standards, using accurate technique, proper antisera and controls

(Consequence) Determination of ABO and Rh type of newborn infants and presence and cause of fetal-maternal incompatibility, if present, and provision of compatible blood for exchange transfusion

(Next Action) Report results; record test results in appropriate log

KNOWLEDGES AND SKILLS

Concept of hemolytic disease of the newborn (disease course, major blood group antibodies causing disease)

MODULE 7 (Continued)

Influence of previous pregnancies on HDN
ABO grouping of cord or infant specimen
(forward grouping only and why)
Rh typing of infant or cord cells
Necessity for proper controls
Wharton's jelly contamination
Uses of slide/modified tube antisera and
saline tube antisera
Correlation of strength of direct Coombs'
test results and causes of HDN (HDN due
to Rh antibodies strongly positive, due
to ABO antibody weakly positive to negative)
Elution techniques
Use of elution for antibody identification
How to choose donor blood compatible with
mother and infant for exchange transfusion
Crossmatching for exchange transfusion

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 8: PRENATAL STUDIES AND RHO IMMUNE GLOBULIN STUDIES

TASKS

a. Perform ABO and Rh typing on maternal sample
b. Perform antibody detection test
c. Identify antibody
d. Determine maternal candidacy for Rho Immune Globulin

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of a properly identified specimen and a request for prenatal testing or determination of Rho Immune Globulin (RhoGam) candidacy

(Behavior) The MLT will determine ABO group and Rh type (including D^u if patient is Rho (D) negative), do antibody detection test and identify antibody if present, do crossmatch with RhoGam

(Conditions) With minimal supervision; using appropriate antiserum, equipment, etc.

(Criteria) Performed in accordance with approved procedures (AABB or commercial source), using accurate technique, proper controls

(Consequence) Determination of ABO and Rh type, presence and identity of irregular antibodies or candidacy of a mother for Rho Immune Globulin (postnatal) to predict and/or prevent cases of HDN

(Next Action) Report results; record test results in appropriate log

KNOWLEDGES AND SKILLS

Rho Immune Globulin (what it is and how it works)
Factors determining a mother's candidacy for Rho Immune Globulin, (mother's Rh type and infant's, if known)
Rho Immune Globulin crossmatch procedure
Administration of Rho Immune Globulin in presence of maternal irregular antibodies
Antibodies capable of causing HDN

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 9: BLOOD DONOR SCREENING

TASKS

a. Receive and register blood donor
b. Take blood donor's medical history
c. Perform general physical examination
d. Obtain signature of release or consent of donor

PERFORMANCE OBJECTIVE

(Stimulus)	Upon arrival of prospective donor
(Behavior)	The MLT will take donor's medical history and perform general physical examination to identify qualified donors
(Conditions)	With supervision; using appropriate oral thermometers, sphygmomanometer and stethoscope, sterile lancets, PVP-iodine, capillary tubes and copper sulfate solution
(Criteria)	In accordance with the most current AABB and BuMed standards for blood donor selection
(Consequence)	Identification of individuals suitable for donating blood
(Next Action)	Prepare blood donor for phlebotomy and perform donor phlebotomy

KNOWLEDGES AND SKILLS

Recognition of signs of good health in general appearance of prospective donor
Principles and techniques to take/check temperature, pulse, blood pressure and hemoglobin content
Qualifying conditions for blood donations, e.g., previous donations, surgery or illness, drug history, medication usage, alcohol habituation, immunizations, pregnancy
Knowledge of when to refer donors with a questionable medical or physical condition to the attending physician and pathologist
Ability to help donor understand medical terms used and medical history questions asked

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 10: BLOOD DONOR BLEEDING PROCEDURES

TASKS

a. Prepare numerical system for identification of donor and blood container
b. Prepare donor's arm for venipuncture
c. Perform donor phlebotomy
d. Perform special donor techniques, e.g., therapeutic bleeding, autologous transfusion, plasmapheresis
e. Provide for postphlebotomy care of donor
f. Provide treatment for donor reaction
g. Provide follow-up treatment for donor reaction
h. Submit blood specimen to laboratory for processing
i. Perform monthly quality control to check sterility of donor phlebotomy procedure

PERFORMANCE OBJECTIVE

(Stimulus)	Upon arrival of qualified donor
(Behavior)	The MLT will verify numerical identification of donor with numerical identification of blood container, prepare donor's arm for phlebotomy, perform phlebotomy, give postphlebotomy care, be attentive for donor reactions during and after phlebotomy and submit donor blood sample to laboratory for testing
(Conditions)	With direct supervision; using appropriate PVP-iodine, sterile gauze (sterility must be in accordance with AABB standards), tourniquet or blood pressure cuff and plastic blood container that is pyrogen-free, sterile and contains sufficient anticoagulant for quantity of blood being collected
(Criteria)	In accordance with accepted AABB standards for blood donor phlebotomy
(Consequence)	Recovery of blood suitable for transfusional use
(Next Action)	Store blood unit in appropriately monitored blood refrigerator immediately

KNOWLEDGES AND SKILLS

Collection of blood conforming to accepted standards of sterility, using a sterile, closed system, sterile cotton and/or gauze

MODULE 10 (Continued)

Types of donor reactions
Appropriate medical treatment procedures and use of emergency equipment
Needs for preparation of donor arm prior to phlebotomy
Techniques to properly prepare donor's arm (using appropriate solution(s)), perform phlebotomy maintaining sterile conditions and with minimal discomfort to donor
Quality control program for collection process (need for and procedure of)

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 11: PROCESSING OF DONOR BLOOD

TASKS

a. Determine ABO (forward and reverse) of donor blood
b. Determine Rho (D) type
c. Determine D^u status of blood
d. Perform approved serologic test for syphilis
e. Perform antibody detection test
f. Determine hemolytic activity of Anti-A and Anti-B of group O donors
g. Label donor units
h. Perform tests for hepatitis-associated antigen (HBAg)
i. Record test results
j. Quarantine irregular donor units

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of properly identified donor unit specimens and need for processing of donor units

(Behavior) The MLT will perform testing procedures to prepare donor blood for future crossmatching and subsequent transfusion, quarantine donor units not meeting AABB processing requirements and keep accurate records of testing results

(Conditions) With minimal supervision; using appropriate reagents, equipment and controls

(Criteria) Donor processing is comprehensively and accurately completed in accordance with approved AABB procedures and requirements, using proper commercial reagents, accurate technique and accurately recording test results

(Consequence) Accurate processing of donor blood for use in subsequent transfusions

(Next Action) Release donor units for future use

KNOWLEDGES AND SKILLS

AABB requirements for processing of donor units
Serologic tests for syphilis
How to label donor units that are Rho (D) negative, D^u positive

MODULE 11 (Continued)

Necessity of negative control when performing a D^u test
Hemolysin tests for hemolytic Anti-A and Anti-B
Identification of irregular antibodies in donor units
Quarantine of irregular donor units (What units to quarantine, how to use, if possible or dispose of, if necessary)
Release of units from quarantine
Methods of HAA testing
Safety precautions to be used in handling potentially infectious materials
Labeling of donor units
Maintenance of temperature within acceptable limits during processing and labeling

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 12: BLOOD COMPONENT PREPARATION

TASKS

a. Prepare red blood cells (human)
b. Prepare fresh frozen plasma
c. Prepare platelet rich plasma (PRP)
d. Prepare platelet concentrates
e. Prepare single donor factor VIII-rich cryoprecipitate
f. Prepare leukocyte-poor whole blood and red blood cells (human)
g. Prepare single donor plasma
h. Label properly and assign correct expiration date to component
i. Maintain component in proper storage conditions prior to infusion

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request for specific blood components
(Behavior)	The MLT will prepare specific blood component requested, label component (including proper expiration date), and maintain component in proper storage conditions prior to infusion
(Conditions)	With supervision; using procedures outlined in the AABB Manual of Component Preparation, appropriate donor bags (multiple bag system), equipment and appropriate donor units
(Criteria)	Performed in strict accordance with accepted AABB standards using proper technique
(Consequence)	Accurately prepared and labeled (including expiration date) blood components for transfusion
(Next Action)	Record preparation and send prepared component to ward for infusion

KNOWLEDGES AND SKILLS

Principles of component therapy
Principles and techniques of component preparation
Clinical uses of each of the major blood components and derivatives
Proper identification, labeling and storage of blood and blood components

MODULE 12 (Continued)

Operation, maintenance and principles of equipment used in blood component preparation, e.g., cryo-cooling bath, plasma extractor apparatus, automated sealer, low temperature freezer, multipak drawing bags
Use of accepted plasma expanders
Risks in transfusion therapy, e.g., syphilis, malaria and viral hepatitis

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 13: QUALITY CONTROL MAINTENANCE

TASKS

a. Check daily blood appearance, expiration dates, number of units stocked
b. Check specificity, potency and expiration dates of antisera, reagents, controls daily and upon receipt of lot number
c. Check daily the temperature of refrigerators, freezers, heat blocks, HO baths, heat (view) box
d. Check monthly the calibration of centrifuges
e. Check monthly for bacterial growth in donor units
f. Check monthly for quality of donor arm scrub
g. Check efficiency and effectiveness of component preparation
h. Maintain current procedure manual
i. Maintain temperature log for frozen blood and blood products
h. Maintain monthly log of all work done

PERFORMANCE OBJECTIVE

(Stimulus) Performed routinely or when directed by supervisor
(Behavior) The MLT will conduct a comprehensive quality control program of equipment, reagents, components and procedures and keep accurate records of such testing results and procedures
(Conditions) Without technical supervision; using proper equipment and reagents
(Criteria) Performed in accordance with BuMed, Bureau of Biologies (BOB), and AABB standards, using appropriate and accurate technique, maintaining accurate and up-to-date records
(Consequence) Accurate quality control of blood bank equipment, reagents and procedures, and accurate records of quality control procedures and test results
(Next Action) Report findings and maintain constant surveillance

KNOWLEDGES AND SKILLS

Current directives for blood and blood component storage
Expiration dates of antisera and reagent cells
Proper use of daily reagent control sheets
Quality control requirements established by the AABB and BOB
tenance of all quality control records

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 14: DONOR CENTER ADMINISTRATION

TASKS

a. Maintain donor files
b. Maintain blood processing records
c. Label and store blood according to group factors and screening
d. Maintain records of dispensation of blood, blood components and products

PERFORMANCE OBJECTIVE

(Stimulus)	To comply with federal and AABB regulations
(Behavior)	The MLT will maintain donor files and blood processing records; label and store blood according to ABO group, Rh type, results of antibody screening and results of hepatitis-associated antigen (HBAg) and syphilis testing
(Conditions)	Without technical supervision
(Criteria)	Performed in accordance with accepted AABB standards and local requirements
(Consequence)	Preparation and maintenance of legible permanent and accurate records to provide an accurate, complete, step-by-step log of a unit of blood or blood component from source to final dispostion
(Next Action)	File logs in blood bank for reference purposes

KNOWLEDGES AND SKILLS

AABB and local requirements for labeling of blood and blood components and derivatives
AABB requirements for blood center records
Local procedures for blood center record keeping
Storage requirements for blood

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Blood Bank

MODULE 15: BLOOD BANK INVENTORY AND TRANSFUSION RECORDS

TASKS

a. Inventory stock blood
b. Release blood on hold and return to stock supply
c. Maintain records of blood from other banks
d. Maintain transfusion request file
e. Maintain transfusion reaction file
f. Maintain irregular antibody file

PERFORMANCE OBJECTIVE

(Stimulus)	Performed routinely or when directed by supervisor
(Behavior)	The MLT will maintain adequate stock; insure that it is rotated and current; keep active files on all transfusions, transfusion reactions and irregular antibodies of patients
(Conditions)	With limited technical supervision; in accordance with local directives for record maintenance of complete test results and interpretation of reaction; and for inventory of stock blood
(Criteria)	Performed in accordance with BuMed and AABB standards
(Consequence)	Maintenance of accurate records and a sufficient supply of whole blood and blood components rotated to insure use before expiration date
(Next Action)	Logs filed for reference purposes, request for additional blood for stock supply

KNOWLEDGES AND SKILLS

Whole blood and blood component requirements for the individual hospital
Purpose of and current instructions regarding maintenance of blood bank records
Age of blood units in stock

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

COMPETENCY UNIT VII: PARASITOLOGY

This unit includes the following Modules:

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Parasitology

MODULE 1: SPECIMEN PREPARATION

TASKS

a. Emulsify feces for testing
b. Prepare MIF (Merthiolate-Iodine-Formalin) preparation
c. Recover parasitic ova and larvae by flotation method
d. Prepare direct fecal smear in hypotonic solution
e. Prepare wet mounts in isotonic solutions
f. Prepare thick and thin blood smears for blood parasites
g. Stain smears to demonstrate parasites
h. Recover and preserve adult worms for diagnosis

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of fecal or body fluid specimen and request for parasitic examination
(Behavior)	The MLT will prepare specimen for examination for ova and parasites
(Conditions)	Without technical assistance; using standard procedures and appropriate glass slides and cover slips, centrifuge, wooden applicator sticks, test tubes and reagents
(Criteria)	Performed in accordance with accepted parasitologic standards regarding technique and standard testing procedures for proper preparation and examination
(Consequence)	Preparation of fecal and/or body fluid specimen for parasite recovery and identification
(Next Action)	Perform microscope examination of fecal sediment and blood smears

KNOWLEDGES AND SKILLS

Specimen preparation for specific examination
Safety precautions in handling biologic material
Function and operation of centrifuge and exhaust hood
Principles and techniques of adult parasite preservation for identification
Reagent preparation techniques
Stain preparation techniques
Principles and techniques of specimen preparation for parasitic recovery
Preparation of thick and thin blood smears for blood parasite examination

Competency: [illegible]

Unit: Parasitology

MODULE 2: BASIC FECAL CHEMICAL ANALYSIS

TASKS

a. Perform macroscopic examination of feces for form, consistency, color, mucus, pus and plant material
b. Test for occult blood using chemical solutions and reagent strips
c. Perform qualitative tests for fecal fat, bilrubin, urobilirubin and starch granules by staining methods

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of fecal specimen and request for fecal chemical analysis
(Behavior)	The MLT will perform basic fecal chemical assays
(Conditions)	With limited supervision; using standard procedures and appropriate reagents, controls and microscope
(Criteria)	Performed in accordance with accepted parasitologic standards regarding direct observation of technique, microscopic and chemical testing
(Consequence)	Valid results on appropriate form demonstrating diagnostic evidence for proper treatment
(Next Action)	Refer diagnostic problems to pathologist and report results

KNOWLEDGES AND SKILLS

Anatomy and physiology of hepatic-biliary, pancreatic and gastrointestinal tracts
Normal value ranges of fecal chemicals found in fecal specimens
Principles of chemical reactions with feces
Preparation and use of reagents
Principles and operation of microscope

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Parasitology

MODULE 3: IDENTIFICATION OF INTESTINAL PARASITES

TASKS

a. Recover intestinal parasites by flotation method
b. Recover intestinal parasites by concentration method
c. Recover intestinal parasites by direct and iron-hematoxylin smear
d. Recover intestinal parasites by rapid permanent mount stain technique
e. Recover intestinal parasites by cultivation method

PERFORMANCE OBJECTIVE

(Stimulus) Upon receipt of test request and specimen for parasite examination

(Behavior) The MLT will perform recovery and examination techniques for the identification of intestinal parasites

(Conditions) Without technical assistance; in a systematic manner, using locally approved techniques and standard light and dissecting microscopes

(Criteria) Performed in accordance with accepted parasitologic standards for recovery and identification of ova and parasites

(Consequence) Maximum recovery of parsites and the reporting of the results on appropriate form giving diagnostic evidence for proper patient treatment

(Next Action) Refer problem cases to reference laboratory for diagnostic confirmation and report results to requesting physician

KNOWLEDGES AND SKILLS

Differential characteristics of intestinal parasites in various stages of development, i.e., size, motility, endoplasm and its inclusions, visibility of nucleus, shape, chromatoid matter and general appearance
Principles and techniques for recovery of various parasites
Fixative techniques to facilitate preservation
Permanent staining methods, e.g., trichrome stain

MODULE 3 (Continued)

Parasite-host relationship and life cycle
Clinical correlation of disease state and parasite found
Principles and use of light and dissecting microscopes
Reagent preparation

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Parasitology

MODULE 4: IDENTIFICATION OF INTESTINAL PROTOZOA

TASKS

a. Prepare direct smears stained by iodine
b. Prepare direct smears in hypotonic solution
c. Detect/identify intestinal protozoa

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request and correctly prepared specimen for protozoa parasite examination
(Behavior)	The MLT will detect and identify protozoa, if present
(Conditions)	Without technical supervision; in a systematic manner, using locally approved procedures and a standard light microscope
(Criteria)	In accordance with accepted parasitologic standards for identification of intestinal protozoa in various developmental forms
(Consequence)	Maximum recovery of protozoa and reporting of results on appropriate forms, giving diagnostic evidence for proper treatment
(Next Action)	Report results to requesting physician

KNOWLEDGES AND SKILLS

Differential characteristics of intestinal protozoa in various stages of development
Principles and procedures of recovery techniques for each type of protozoa
Use of fixative technique, e.g., PVA (Polyvinyl alcohol)
Use of modified staining methods
Clinical correlation
Parasite-host relationship

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Parasitology

MODULE 5: IDENTIFICATION OF HELMINTHS

TASKS

a. Identify Nematode, Cestode or Trematode ova
b. Identify Cestode, Nematode or Trematode larvae or adult forms

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request and correctly prepared specimen for parasite examination for helminths and related forms
(Behavior)	The MLT will recover and identify helminths in ova and/or adult form, if any
(Conditions)	Without technical supervision; using approved procedures, reference texts and dissecting microscope
(Criteria)	In accordance with accepted parasitologic standards for identification of helminth ova and adult forms
(Consequence)	Proper identification and reporting of results giving diagnostic evidence for proper patient treatment
(Next Action)	Report results to requesting physician

KNOWLEDGES AND SKILLS

Morphology of helminths in various life forms
Recovery and identification techniques for helminths and related forms
Parasite-host relationship and life cycle
Clinical correlation

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Parasitology

MODULE 6: IDENTIFICATION OF BLOOD PARASITES

TASKS

a. Perform malariology examinations using thick smear
b. Perform malariology examinations using thin smear
c. Microscopically examine blood for non-malarial parasites

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of prepared blood films for blood parasite examination
(Behavior)	The MLT will stain and identify blood parasites, if any
(Conditions)	With supervision; in a systematic way, using reference texts, light microscope and reference slide preparation
(Criteria)	In accordance with accepted parasitologic standards for identification of common blood parasitic pathogens in various morphologic forms and developmental stages
(Consequence)	Proper identification and reporting of results on request form, giving diagnostic evidence for proper patient treatment
(Next Action)	Refer to pathologist for diagnostic confirmation and report results to requesting physician

KNOWLEDGES AND SKILLS

Morphology of blood parasites in various developmental stages in its life cycle
Staining techniques for blood parasites
Basic anatomy, physiology and distribution of blood parasites with clinical correlation
Examination techniques for malarial diagnosis and species identification
Screening techniques for smears for non-malarial blood parasite recognition

Competency: MEDICAL LABORATORY TECHNICIAN (MLT)

Unit: Parasitology

MODULE 7: EXAMINATION FOR BODY FLUIDS AND TISSUE PARASITES

TASKS

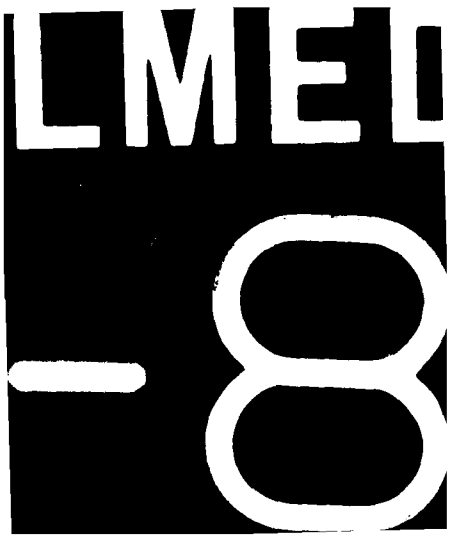
a. Microscopically examine duodenal drainage and body fluids for ova and parasites
b. Microscopically examine tissue for ova and parasites

PERFORMANCE OBJECTIVE

(Stimulus)	Upon receipt of request and correctly prepared body fluid or tissue specimen for parasite examination
(Behavior)	The MLT will detect and identify specific parasites, if any
(Conditions)	With limited technical supervision; in a systematic manner, using reference texts, appropriate microscope and locally approved procedures
(Criteria)	Performed in accordance with accepted standards for demonstration of diagnostic parasitic forms
(Consequence)	Proper identification of body fluid or tissue parsites, giving diagnostic evidence for proper patient treatment
(Next Action)	Report results

KNOWLEDGES AND SKILLS

Possible parasites for the specific specimen
Differential characteristics of possible parasites
Recovery techniques for possible parasites
Use of stains for various parasites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